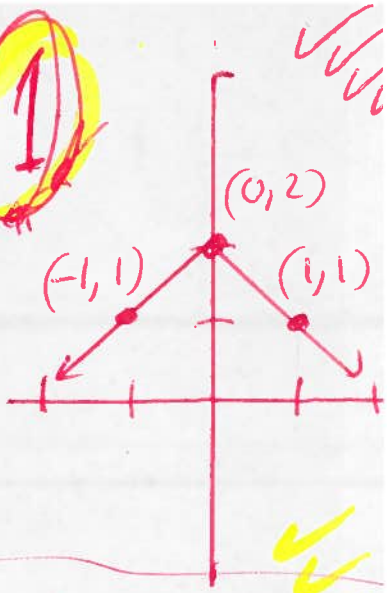
① Graph $y = -|x| + 2$

x	y
-1	1
0	2
1	1

$y = -|-1| + 2$
$y = -(1) + 2$
$y = -1 + 2$
$y = 1$

$y = -|0| + 2$
$y = -(0) + 2$
$y = 0 + 2$
$y = 2$

$y = -|1| + 2$
$y = -(1) + 2$
$y = -1 + 2$
$y = 1$



1

② $\frac{6}{y+4} - \frac{4}{y-4} = \frac{6}{y^2-16}$

LCD $= (y+4)(y-4)$

$\frac{6}{y+4} - \frac{4}{y-4} = \frac{6}{(y+4)(y-4)}$

$\left(\frac{6}{y+4}\right)(y+4)(y-4) - \left(\frac{4}{y-4}\right)(y+4)(y-4) = \frac{6}{(y+4)(y-4)}(y+4)(y-4)$

$6(y-4) - 4(y+4) = 6$
$6y - 24 - 4y - 16 = 6$
$2y - 40 = 6$
$2y - 40 + 40 = 6 + 40$
$2y = 46$
$\frac{2y}{2} = \frac{46}{2}$

$y = 23$

Math 1314
Final Exam
review
2-8-13

(3) $\frac{7-5i}{6+5i} =$

$\left(\frac{7-5i}{6+5i}\right)\left(\frac{6-5i}{6-5i}\right) =$

$\frac{42-35i-30i+25i^2}{36-30i+30i-25i^2} =$

$\frac{42-65i+25i^2}{36-25i^2} =$

$\frac{42-65i+25(-1)}{36-25(-1)} =$

$\frac{42-65i-25}{36+25} =$

$\frac{17-65i}{61} =$

$\frac{17}{61} - \frac{65}{61}i =$

(4) Solve by factoring

$12x^2+31x+20=0$

$(4x+5)(3x+4)=0$

Set $4x+5=0$ OR $3x+4=0$

$4x+5-5=0-5$ OR $3x+4-4=0-4$

$4x=-5$ OR $3x=-4$

$\frac{4x}{4}=\frac{-5}{4}$ OR $\frac{3x}{3}=\frac{-4}{3}$

$x=-5/4$ OR $x=-4/3$

(5) $(5x+5)^2 = 100$ Solve by square root method

$\sqrt{(5x+5)^2} = \pm\sqrt{100}$

$5x+5 = \pm 10$

$5x+5 = -10$ OR $5x+5 = 10$

$5x+5-5 = -10-5$ OR $5x+5-5 = 10-5$

$5x = -15$ OR $5x = 5$

$\frac{5x}{5} = \frac{-15}{5}$ OR $\frac{5x}{5} = \frac{5}{5}$

$x = -3$ OR $x = 1$

3.

(6.) Complete the square

$x^2+14x+33 = 0$

$x^2+14x = -33$

$x^2+14x+\left(\frac{1}{2}(14)\right)^2 = -33+\left(\frac{1}{2}(14)\right)^2$

$x^2+14x+(7)^2 = -33+(7)^2$

$x^2+14x+49 = -33+49$

$x^2+14x+49 = 16$

$(x+7)(x+7) = 16$

$(x+7)^2 = 16$

$\sqrt{(x+7)^2} = \pm\sqrt{16}$

$x+7 = \pm 4$

$x+7 = -4$ OR $x+7 = 4$

$x+7-7 = -4-7$ OR $x+7-7 = 4-7$

$x = -11$ OR $x = -3$

7. $4x^2 = -12x - 2$ use the Quadratic Formula

$4x^2 + 12x + 2 = 0$

$a = 4, \quad b = 12, \quad c = 2$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(12) \pm \sqrt{(12)^2 - 4(4)(2)}}{2(4)}$$

$$x = \frac{-12 \pm \sqrt{144 - 32}}{8}$$

$$x = \frac{-12 \pm \sqrt{112}}{8}$$

$$x = \frac{-12 \pm \sqrt{16 \cdot 7}}{8}$$

$$x = \frac{-12 \pm \sqrt{16}\sqrt{7}}{8}$$

$$x = \frac{-12 \pm 4\sqrt{7}}{8}$$

$$x = \frac{\cancel{4}(-3 \pm 1\sqrt{7})}{\cancel{4}(2)}$$

$$x = \frac{-3 \pm \sqrt{7}}{2}$$

$$x = \frac{-3 + \sqrt{7}}{2} \quad \text{OR} \quad x = \frac{-3 - \sqrt{7}}{2}$$

4.

Primes
2, 3, 5, 7, 11, 13, ...

$112 = 2 \cdot 56$
$56 = 2 \cdot 28$
$28 = 2 \cdot 14$
$14 = 2 \cdot 7$
$7 = 7 \cdot 1$

(8) $1x^2 - 14x + 53 = 0$ use Quadratic formula

$a = 1,\ b = -14,\ c = 53$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-14) \pm \sqrt{(-14)^2 - 4(1)(53)}}{2(1)}$$

$$x = \frac{14 \pm \sqrt{196 - 212}}{2}$$

$$x = \frac{14 \pm \sqrt{-16}}{2}$$

$$x = \frac{14 \pm 4i}{2}$$

$$x = 7 \pm 2i$$

$x = 7 + 2i$ OR $x = 7 - 2i$

(9) $\sqrt{22x+11} = x+6$

$(\sqrt{22x+11})^2 = (x+6)^2$

$22x+11 = (x+6)(x+6)$

$22x+11 = x^2 + 6x + 6x + 36$

$22x+11 = x^2 + 12x + 36$

$0 = x^2 + 12x + 36 - 22x - 11$

$0 = x^2 - 10x + 25$

$0 = (x-5)(x-5)$

$x-5=0$ OR $x-5=0$

$x-5+5=0+5$ OR $x-5+5=0+5$

$x=5$ OR $x=5$

Good

Ck

$\sqrt{22x+11} = x+6$

$\sqrt{22(5)+11} = (5)+6$

$\sqrt{110+11} = 5+6$

$\sqrt{121} = 11$

$11 = 11$

Good

$\{5\}$

(10) $x - \sqrt{3x-2} = 4$

$\cancel{x} - \sqrt{3x-2} \ \cancel{-x} = 4 - x$

$-\sqrt{3x-2} = 4 - x$

$-1(-\sqrt{3x-2}) = -1(4-x)$

$\sqrt{3x-2} = -4 + x$

$(\sqrt{3x-2})^2 = (-4+x)^2$

$3x - 2 = (-4+x)(-4+x)$

$3x - 2 = 16 - 4x - 4x + x^2$

$3x - 2 = x^2 - 8x + 16$

$0 = x^2 - 8x + 16 - 3x + 2$

$0 = x^2 - 11x + 18$

$0 = (x-2)(x-9)$

Set $x - 2 = 0$ OR $x - 9 = 0$

$x - 2 + 2 = 0 + 2$ OR $x - 9 + 9 = 0 + 9$

$\cancel{x = 2}$ BAD OR $x = 9$ Good

Ck $x - \sqrt{3x-2} = 4$

$(2) - \sqrt{3(2)-2} = 4$

$2 - \sqrt{6-2} = 4$

$2 - \sqrt{4} = 4$

$2 - 2 = 4$

$0 \neq 4$

BAD

Ck $x - \sqrt{3x-2} = 4$

$(9) - \sqrt{3(9)-2} = 4$

$9 - \sqrt{27-2} = 4$

$9 - \sqrt{25} = 4$

$9 - 5 = 4$

$4 = 4$

Good

$\{9\}$

11. $|x-4|=6$

$|x|=a$

$x=-a$ OR $x=a$

$x-4=-6$ OR $x-4=6$

$x-4+4=-6+4$ OR $x-4+4=6+4$

$x=-2$ OR $x=10$

$\{-2, 10\}$

7

12. $|x+2|<2$

$|x|<a$

$-a<x<a$

$-2<x+2<2$

$-2-2<x+2-2<2-2$

$-4<x<0$

$(-4, 0)$

13. $f(x)=4x^2-2x+7$

$f(x-1)=4(x-1)^2-2(x-1)+7$

$f(x-1)=4(x-1)(x-1)-2(x-1)+7$

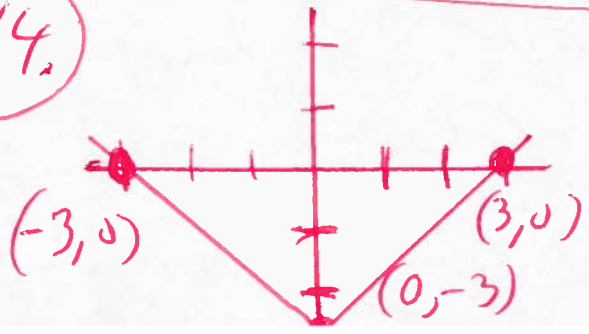
$f(x-1)=4(x^2-x-x+1)-2(x-1)+7$

$f(x-1)=4(x^2-2x+1)-2(x-1)+7$

$f(x-1)=4x^2-8x+4-2x+2+7$

$f(x-1)=4x^2-10x+13$

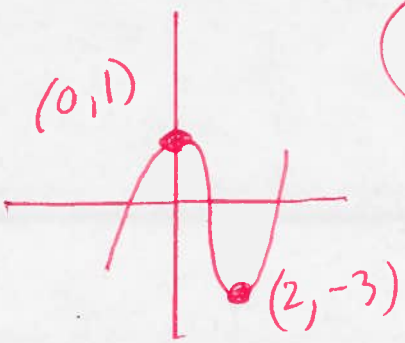
14.



x-intercepts $(-3,0)$ $(3,0)$

y-intercept $(0,-3)$

(15) $f(x) = x^3 - 3x^2 + 1$



Local maximum = (0, 1)
Local minimum = (2, −3)

OR Graphing Calculator

$Y_1 = X\wedge 3 - 3X\wedge 2 + 1$

(16) $f(x) = 4x^2 + x^4$

$f(-x) = 4(-x)^2 + (-x)^4$

$f(-x) = 4(-x)(-x) + (-x)(-x)(-x)(-x)$

$f(-x) = 4x^2 + x^4$

Since $f(-x) = f(x)$ Even function

(17) Graph

$$f(x) = \begin{cases} x+1 & \text{if } x < 1 \\ -5 & \text{if } x \geq 1 \end{cases}$$

x	f(x)
0	1
1	(2)

$f(0) = 0 + 1 = 1$

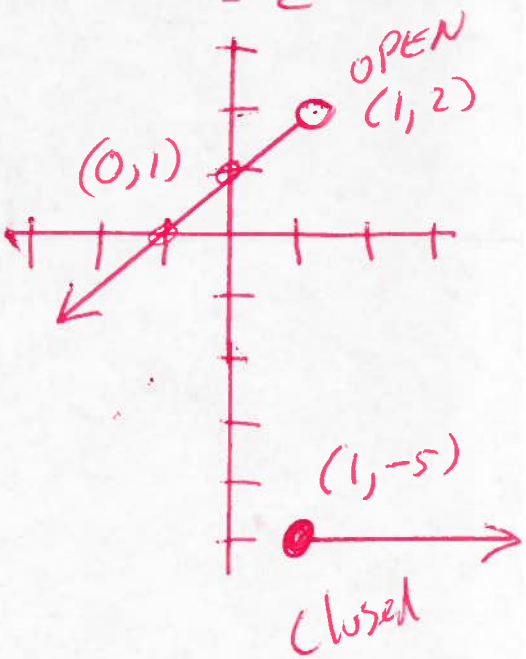
$f(1) = 1 + 1 = 2$

OR

Graphing Calculator

$Y_1 = X+1 \div (X < 1)$

$Y_2 = -5 \div (X \geq 1)$



(18) $f(x) = x^2 + 9x - 2$

9.

$$\frac{f(x+h) - f(x)}{h} =$$

$$\frac{\left((x+h)^2 + 9(x+h) - 2\right) - \left(x^2 + 9x - 2\right)}{h} =$$

$$\frac{\left((x+h)(x+h) + 9(x+h) - 2\right) - \left(x^2 + 9x - 2\right)}{h} =$$

$$\frac{x^2 + xh + xh + h^2 + 9x + 9h - 2 - x^2 - 9x + 2}{h} =$$

$$\frac{x^2 + 2xh + h^2 + 9x + 9h - 2 - x^2 - 9x + 2}{h} =$$

$$\frac{2xh + h^2 + 9h}{h} =$$

$$2x + h + 9 =$$

(19) Find the equation of the line

slope $= m = -3$, point $= (-7, 2)$ (x_1, y_1)

$y - y_1 = m(x - x_1)$

$y - (2) = -3(x - (-7))$

$y - 2 = -3(x + 7)$

$y - 2 = -3x - 21$

$y - 2 + 2 = -3x - 21 + 2$

$y = -3x - 19$

10

(20) Find the average rate of change

$x_1 = 5 \quad x_2 = 6$

$\frac{f(B) - f(A)}{B - A}$

$f(x) = -3x^2 - x$

$\frac{f(6) - f(5)}{6 - 5} =$

$\frac{(-3(6)^2 - (6)) - (-3(5)^2 - (5))}{6 - 5} =$

$\frac{(-3(36) - 6) - (-3(25) - 5)}{1} =$

$\frac{(-108 - 6) - (-75 - 5)}{1} =$

$\frac{(-114) - (-80)}{1} =$

$\frac{-114 + 80}{1} =$

$\frac{-34}{1} =$

$-34 =$

(21.) Graph

$h(x) = |x-5|-5$

$h(4) = |4-5|-5$

$h(4) = |-1|-5$

$h(4) = (1)-5$

$h(4) = -4$

$h(5) = |5-5|-5$

$h(5) = |0|-5$

$h(5) = (0)-5$

$h(5) = -5$

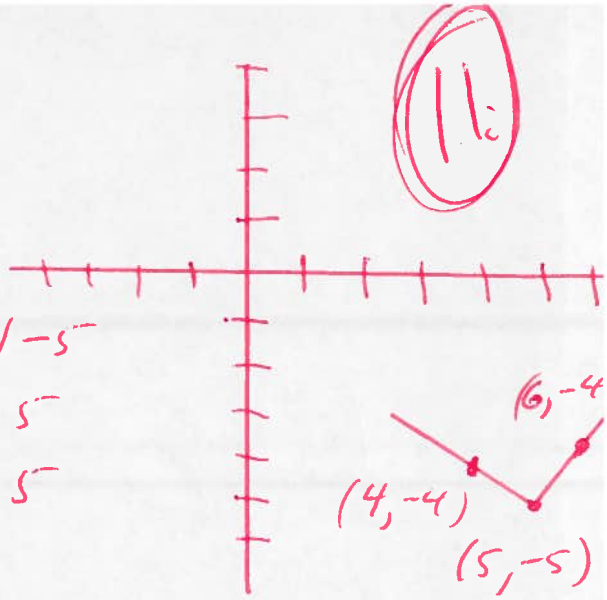
x	h(x)
4	-4
5	-5
6	-4

$h(6) = |6-5|-5$

$h(6) = |1|-5$

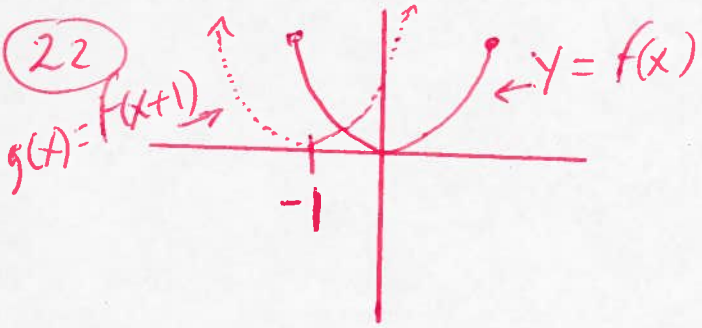
$h(6) = (1)-5$

$h(6) = -4$



11.c

(22)



shift Left −1

$g(x) = f(x+1)$

opposite

(23) Find the Domain

$f(x) = \sqrt{24-x}$

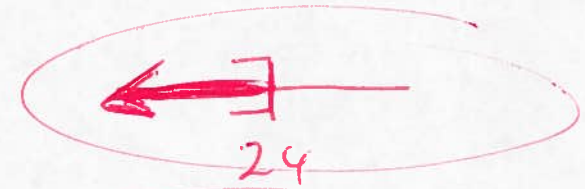
Set $24 - x \geq 0$

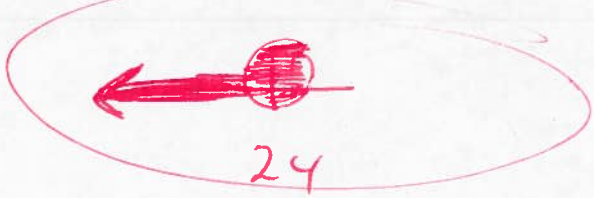
$24 - x - 24 \geq 0 - 24$

$-x \geq -24$

$\frac{-x}{-1} \leq \frac{-24}{-1}$

$x \leq 24$





$(-\infty, 24]$

(24) Find the Domain

$$\frac{x}{\sqrt{x-2}}$$ only

Set $x-2>0$

$x-2+2>0+2$

$x>2$

$(2, +\infty)$

12

(25) $f(x)=9x-2$ and $g(x)=4x-7$

Find $f-g=$

$f(x)-g(x)=$

$(9x-2)-(4x-7)=$

$9x-2-4x+7=$

$5x+5=$

(26) $f(x)=3x^2-8x$ and $g(x)=x^2-5x-24$

$\frac{f}{g}=$

$\frac{f(x)}{g(x)}=$

$$\frac{3x^2-8x}{x^2-5x-24}=$$

13.

(27) $f(x) = 9 - 2x$ and $g(x) = -4x + 2$

$f + g =$

$f(x) + g(x) =$

$(9 - 2x) + (-4x + 2) =$

$9 - 2x - 4x + 2 =$

$-6x + 11 =$

(28) $f(x) = 3x - 6$ and $g(x) = 5x - 7$

$f \cdot g =$

$f(x) \cdot g(x) =$

$(3x - 6)(5x - 7) =$

$15x^2 - 21x - 30x + 42 =$

$15x^2 - 51x + 42 =$

(29) $f(x) = x^2 + 2x - 1$ and $g(x) = x^2 - 2x + 3$

$(f \circ g)(-2) =$

$f(g(-2)) =$

$f((-2)^2 - 2(-2) + 3) =$

$f((-2)(-2) - 2(-2) + 3) =$

$f(4 + 4 + 3) =$

$f(11) =$

$(11)^2 + 2(11) - 1 =$

$(11)(11) + 2(11) - 1 =$

$121 + 22 - 1 =$ 142

(30) $f(x) = 3x + 14$ and $g(x) = 2x - 1$

14

$(f \circ g)(x) =$

$f(g(x)) =$

$f(2x-1) =$

$3(2x-1) + 14 =$

$6x - 3 + 14 =$

$6x + 11 =$

(31.) $f(x) = 4x^2 + 6x + 5$ and $g(x) = 6x - 7$

$(g \circ f)(x) =$

$g(f(x)) =$

$g(4x^2 + 6x + 5) =$

$6(4x^2 + 6x + 5) - 7 =$

$24x^2 + 36x + 30 - 7 =$

$24x^2 + 36x + 23 =$

(32.) Find the inverse

$$f(x) = \frac{8}{3x+7}$$

Set $y = \frac{8}{3x+7}$

INV VAR $x = \frac{8}{3y+7}$

$$x(3y+7) = \left(\frac{8}{3y+7}\right)(3y+7)$$

$$3xy + 7x = 8$$

$$3xy + 7x - 7x = 8 - 7x$$

$$3xy = 8 - 7x$$

$$\frac{3xy}{3x} = \frac{8-7x}{3x}$$

$$y = \frac{8-7x}{3x}$$

$$y = \frac{8}{3x} - \frac{7x}{3x}$$

$$y = \frac{8}{3x} - \frac{7}{3}$$

$$f^{-1}(x) = \frac{8}{3x} - \frac{7}{3}$$

15

(33) Find the distance between the points

$(-1, -3)$ $(-5, 0)$

x_1 y_1 x_2 y_2

16 pts

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

$$d = \sqrt{((-1) - (-5))^2 + ((-3) - (0))^2}$$

$$d = \sqrt{(-1 + 5)^2 + (-3 - 0)^2}$$

$$d = \sqrt{(4)^2 + (-3)^2}$$

$$d = \sqrt{16 + 9}$$

$$d = \sqrt{25}$$

$$d = 5$$

(34) Find the distance between the points

$(0, 0)$ $(-1, -5)$

x_1 y_1 x_2 y_2

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

$$d = \sqrt{((0) - (-1))^2 + ((0) - (-5))^2}$$

$$d = \sqrt{(0 + 1)^2 + (0 + 5)^2}$$

$$d = \sqrt{(1)^2 + (5)^2}$$

$$d = \sqrt{1 + 25}$$

$$d = \sqrt{26}$$

(35) Find the midpoint between the points

$(5, 1)$ $(3, 0)$

x_1, y_1 x_2, y_2

$$\text{midpoint} = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

17.

$$\text{midpoint} = \left(\frac{(5)+(3)}{2}, \frac{(1)+(0)}{2}\right)$$

$$\text{midpoint} = \left(\frac{5+3}{2}, \frac{1+0}{2}\right)$$

$$\text{midpoint} = \left(\frac{8}{2}, \frac{1}{2}\right)$$

$$\text{midpoint} = \left(4, \frac{1}{2}\right)$$

(36) $x^2+y^2-8x-12y+43=0$

Graph the circle. Find center and radius. Complete the square

$x^2-8x+y^2-12y=-43$

$x^2-8x+\left(\frac{1}{2}(-8)\right)^2+y^2-12y+\left(\frac{1}{2}(-12)\right)^2=-43+\left(\frac{1}{2}(-8)\right)^2+\left(\frac{1}{2}(-12)\right)^2$

$x^2-8x+(-4)^2+y^2-12y+(-6)^2=-43+(-4)^2+(-6)^2$

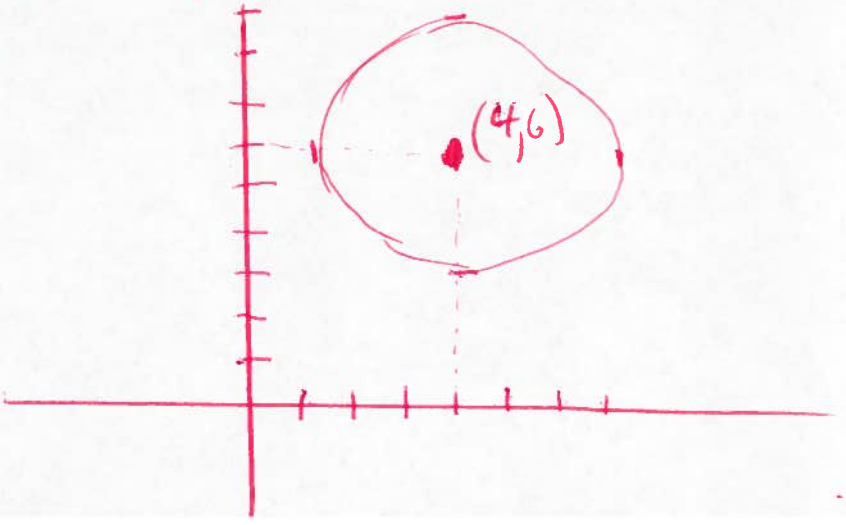
$x^2-8x+16+y^2-12y+36=-43+16+36$

$(x-4)(x-4)+(y-6)(y-6)=9$

$(x-4)^2+(y-6)^2=9$

CENTER $=(4,6)$

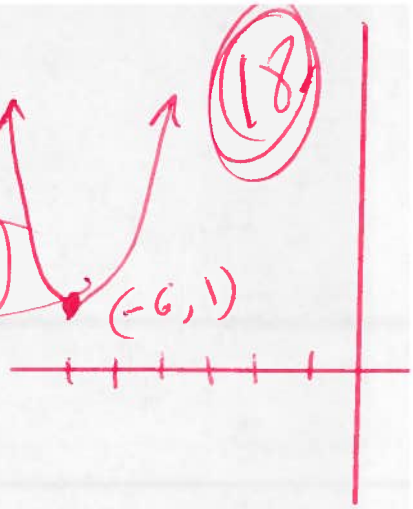
Radius $=\sqrt{9}=3$



(37) Graph $f(x) = 2(x+6)^2 + 1$

Vertex $= (-6, 1)$ graph opens up

graphing calculator $Y_1 = 2(X+6)^2 + 1$



(18)

(38) Graph $f(x) = -x^2 - 4x + 5$

Find the vertex with Vertex formula

Vertex $= \left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$ $a = -1$, $b = -4$, $c = 5$

Vertex $= \left(-\frac{(-4)}{2(-1)}, f\left(-\frac{(-4)}{2(-1)}\right)\right)$

Vertex $= \left(\frac{4}{-2}, f\left(\frac{4}{-2}\right)\right)$

Vertex $= (-2, f(-2))$

Vertex $= (-2, -(-2)^2 - 4(-2) + 5)$

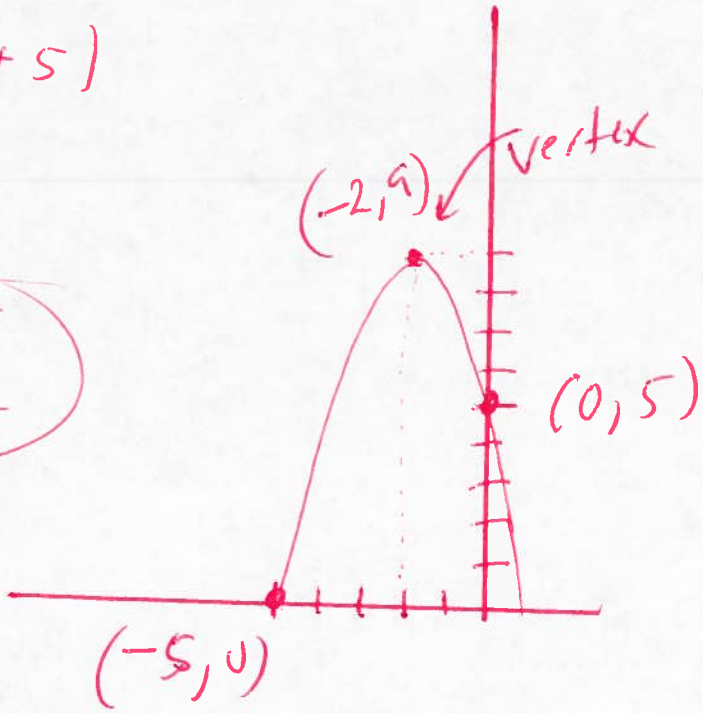
Vertex $= (-2, -(-2)(-2) - 4(-2) + 5)$

Vertex $= (-2, -4 + 8 + 5)$

Vertex $= (-2, 9)$

graphing calculator

$Y_1 = -X^2 - 4X + 5$



(39) $h(x) = -16x^2 + 160x$ Find the max

$a=-16,\ b=160,\ c=0$ (use Vertex formula)

19.

$\text{Vertex} = \left(\frac{-b}{2a},\ f\left(\frac{-b}{2a}\right)\right)$

$\text{Vertex} = \left(\frac{-(160)}{2(-16)},\ f\left(\frac{-(160)}{2(-16)}\right)\right)$

$\text{Vertex} = \left(\frac{-160}{-32},\ f\left(\frac{-160}{-32}\right)\right)$

$\text{Vertex} = (5,\ f(5))$

$\text{Vertex} = (5,\ -16(5)^2 + 160(5))$

$\text{Vertex} = (5,\ -16(5)(5) + 160(5))$

$\text{Vertex} = (5,\ -16(25) + 160(5))$

$\text{Vertex} = (5,\ -400 + 800)$

$\text{Vertex} = (5,\ 400)$

$\text{max} = 400$

(40) Graph $f(x) = 3x^4 - 2x^2$

graphing calculator $y = 3x\wedge 4 - 2x\wedge 2$

20.

(41) Find the zeros

$f(x) = x^3 + x^2 - 20x$

Set $x^3 + x^2 - 20x = 0$

$x(x^2 + x - 20) = 0$

$x(x-4)(x+5) = 0$

$x = 0$ OR $x - 4 = 0$ OR $x + 5 = 0$

$x - 4 + 4 = 0 + 4$ OR $x + 5 - 5 = 0 - 5$

$x = 4$ OR $x = -5$

$\{0, 4, -5\}$

(42) $f(x) = x^3 + 5x^2 - x - 5$ use synthetic division (Try $\pm 1, \pm 5$)

$$\begin{array}{r|rrrr} -1 & 1 & 5 & -1 & -5 \\ & & -1 & -4 & 5 \\ \hline & 1 & 4 & -5 & 0 \end{array}$$ Rem

Set $x^2 + 4x - 5 = 0$

$(x-1)(x+5) = 0$

$x - 1 = 0$ OR $x + 5 = 0$

$x - 1 + 1 = 0 + 1$ OR $x + 5 - 5 = 0 - 5$

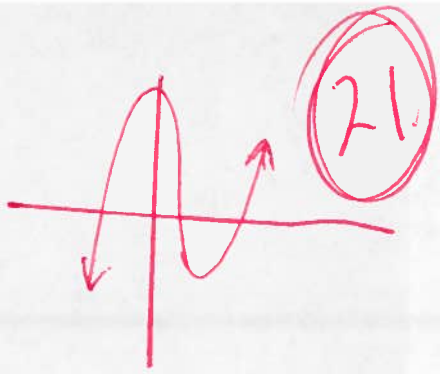
$x = 1$ OR $x = -5$

$\{-1, 1, -5\}$

(43) Graph $f(x) = x^3 - 2x^2 - 5x + 6$

graphing calculator

$y = x^3 - 2x^2 - 5x + 6$



21

(44) $f(x) = 4x^3 - 7x^2 - 4x + 10$ use synthetic division and the Remainder Theorem to find $f(-3)$

$$\begin{array}{r|cccc} -3 & 4 & -7 & -4 & 10 \\ & & -12 & 57 & -159 \\ \hline & 4 & -19 & 53 & -149 \end{array}$$

$f(-3) = -149$

(45) $x^3 - 2x^2 - 5x + 6 = 0$ use synthetic division and $x = 3$ to solve.

$$\begin{array}{r|cccc} 3 & 1 & -2 & -5 & 6 \\ & & 3 & 3 & -6 \\ \hline & 1 & 1 & -2 & 0 \end{array}$$ Rem

Set $x^2 + x - 2 = 0$

$(x-1)(x+2) = 0$

$x - 1 = 0$ OR $x + 2 = 0$

$x - 1 + 1 = 0 + 1$ OR $x + 2 - 2 = 0 - 2$

$x = 1$ OR $x = -2$

$\{3, 1, -2\}$

(46) Use the Rational Zero Theorem to list the possible rational zeros.

$f(x) = 5x^4 - x^2 + 3$ $\quad \frac{\pm 3}{5} = \frac{\pm 3, \pm 1}{5, 1}$

$\frac{\pm 3}{5} \quad \frac{\pm 3}{1}, \frac{\pm 1}{5}, \frac{\pm 1}{1} =$

$\pm\frac{3}{5}, \pm 3, \pm\frac{1}{5}, \pm 1$

(47) Solve using synthetic division

$f(x) = 1x^3 + 8x^2 + 25x + 26$ $\quad \pm 26, \pm 13, \pm 2, \pm 1$

-2	1	8	25	26
		-2	-12	-26
	1	6	13	0

$1x^2 + 6x + 13 = 0$

$a = 1, \; b = 6, \; c = 13$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{-(6) \pm \sqrt{(6)^2 - 4(1)(13)}}{2(1)}$

$x = \frac{-6 \pm \sqrt{36 - 52}}{2}$

$x = \frac{-6 \pm \sqrt{-16}}{2}$

$x = \frac{-6 \pm 4i}{2}$

$x = -3 \pm 2i$

$x = -3 + 2i$

OR

$x = -3 - 2i$

$\{-2, -3+2i, -3-2i\}$

(48) $x^3+3x^2-4x-12=0$

$\pm 12, \pm 6, \pm 4, \pm 3, \pm 2, \pm 1$

Use synthetic division to solve

2^3

-2 | 1 | 3 | −4 | −12
| | −2 | −2 | 12
| 1 | 1 | −6 | 0

$x^2+x-6=0$

$(x-2)(x+3)=0$

Set $x-2=0$ OR $x+3=0$

$x-2+2=0+2$ OR $x+3-3=0-3$

$x=2$ OR $x=-3$

$\{-2, 2, -3\}$

(49.) $x^3+3x^2-8x+10=0$

Use synthetic division to solve

$\pm 10, \pm 5, \pm 2, \pm 1$

-5 | 1 | 3 | −8 | 10
| | −5 | 10 | −10
| 1 | −2 | 2 | 0 Rem

$1x^2-2x+2=0$

$a=1, \quad b=-2, \quad c=2$

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$x=\frac{-(-2)\pm\sqrt{(-2)^2-4(1)(2)}}{2(1)}$

$x=\frac{2\pm\sqrt{4-8}}{2}$

$x=\frac{2\pm\sqrt{-4}}{2}$

$x=\frac{2\pm 2i}{2}$

$x=1\pm 1i$

$x=1+i$ OR $x=1-i$

$\{-5, 1+i, 1-i\}$

(50) $x^4 - 3x^3 + 26x^2 - 22x - 52 = 0$

$\pm 52, \pm 26, \pm 13, \pm 2, \pm 1$

Use Synthetic division to solve

24

-1	1	-3	26	-22	-52
		-1	4	-30	52
	1	-4	30	-52	0 Rem

2	1	-4	30	-52	
		2	-4	52	
	1	-2	26	0	Rem

Set $x^2 - 2x + 26 = 0$

$a = 1, \quad b = -2, \quad c = 26$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(26)}}{2(1)}$$

$$x = \frac{2 \pm \sqrt{4 - 104}}{2}$$

$$x = \frac{2 \pm \sqrt{-100}}{2}$$

$$x = \frac{2 \pm 10i}{2}$$

$$x = 1 \pm 5i$$

$x = 1 + 5i$ OR $x = 1 - 5i$

$\{-1, 2, 1+5i, 1-5i\}$

(51) Find the nth degree polynomial function

$n=3$, -1 and $2+3i$ are zeros

$x=-1$, $x=2+3i$, $x=2-3i$ ← since $a+bi$ and $a-bi$

$x+1=0$, $x-2-3i=0$, $x-2+3i=0$

1.5c

$(x+1)(x-2-3i)(x-2+3i)=0$

$(x+1)(x^2-2x+3ix-2x+4-6i-3ix+6i-9i^2)=0$

$(x+1)(x^2-4x+4-9i^2)=0$

$(x+1)(x^2-4x+4-9(-1))=0$

$(x+1)(x^2-4x+4+9)=0$

$(x+1)(x^2-4x+13)=0$

$x^3-4x^2+13x+x^2-4x-13=0$

$$x^3-3x^2+9x-13=0$$

(52) Find the polynomial

$n=4$, $2i$, 7, and -7 are zeros

$x=2i$, $x=-2i$, $x=7$, $x=-7$

$x-2i=0$, $x+2i=0$, $x-7=0$, $x+7=0$

$(x-2i)(x+2i)(x-7)(x+7)=0$

$(x^2+2ix-2ix-4i^2)(x^2+7x-7x-49)=0$

$(x^2-4i^2)(x^2-49)=0$

$(x^2-4(-1))(x^2-49)=0$

$(x^2+4)(x^2-49)=0$

$x^4-49x^2+4x^2-196=0$

$x^4-45x^2-196=0$

(53) Find the Domain

$$h(x)=\frac{x+2}{x^2-49}$$

Set $x^2-49=0$

$(x+7)(x-7)=0$

$x+7=0$ OR $x-7=0$

$x+7-7=0-7$ OR $x-7+7=0+7$

$x=-7$ OR $x=7$

Domain $=\{x \mid x\neq -7 \text{ OR } x\neq 7\}$

(54) Find the vertical asymptotes

$$\frac{x-81}{x^2-15x+56}$$

27.

Set $x^2-15x+56=0$

$(x-7)(x-8)=0$

$x-7=0$ OR $x-8=0$

$x-7+7=0+7$ OR $x-8+8=0+8$

$x=7$ OR $x=8$

(55) Find the Horizontal asymptote.

$$f(x)=\frac{25x}{5x^2+1}$$

$$\frac{25x}{5x^2}=$$

$$\frac{5}{x}=$$

$$\lim_{x\to\infty}\frac{5}{x}=0$$

$y=0$ ✓

(56) Find the Horizontal asymptote

$$g(x)=\frac{4x^2-7x-5}{7x^2-3x+7}$$

$$y=HA=\frac{4x^2}{7x^2}$$

$y=\frac{4}{7}$ ✓

(57) Find the Slant asymptote
(Use Syntetic division)

28.

$$f(x) = \frac{x^2 + 3x - 8}{x - 4}$$

$$\begin{array}{r|rrr} 4 & 1 & 3 & -8 \\ & & 4 & 28 \\ \hline & 1 & 7 & 20 \end{array}$$

$y = x + 7$ ✓

(58) $\frac{x-7}{x+8} < 0$ Solve

Set $x - 7 = 0$ or $x + 8 = 0$

$x = 7$ or $x = -8$

$(-8, 7)$

Check -9 | 0 | 8

-8 … 7

$\frac{x-7}{x+8} < 0$	$\frac{x-7}{x+8} < 0$	$\frac{x-7}{x+8} < 0$
$\frac{-9-7}{-9+8} < 0$	$\frac{0-7}{0+8} < 0$	$\frac{8-7}{8+8} < 0$
$\frac{-16}{-1} < 0$	$\frac{-7}{8} < 0$	$\frac{1}{16} < 0$
$16 < 0$ NO	YES	NO

29

(59) $f(x) = 700(0.5)^{\frac{x}{50}}$

$f(130) = 700(0.5)^{\frac{130}{50}}$

$f(130) = 700(0.5)\wedge(130/50)$

use graphing calculator

$f(130) = 115.45694422$

(60) $f(x) = 146e^{0.049x}$

$f(7) = 146e^{0.049(7)}$

$f(7) = 146e\wedge(0.049(7))$

use graphing calculator

$f(7) = 205.7386392$

(61) $f(x) = Y_0e^{0.014x}$

$X = 2003 - 1999$

$X = 4$

$f(x) = 8,911,000e^{0.014x}$

$Y_0 = 8,911,000$

$f(4) = 8,911,000e^{0.014(4)}$

$f(4) = 8911000e\wedge(0.014(4))$

use graphing calculator

$f(4) = 9424252.96$

(62) $D(h) = 7e^{-0.4h}$

use graphing calculator

$D(9) = 7e^{-0.4(9)}$

$D(9) = 7e\wedge(-0.4(9))$

$D(9) = .19126605 71$

(63) Find the domain

$f(x) = \ln(6-x)$

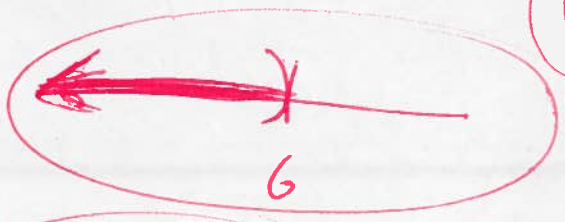
Set $6-x>0$ only

$6-x-6>0-6$

$-x>-6$

$\frac{-x}{-1} < \frac{-6}{-1}$

$x<6$



(30.)

$(-\infty, 6)$

(64.) Find the domain

$f(x) = \log(x^2-8x+12)$

Set $x^2-8x+12>0$

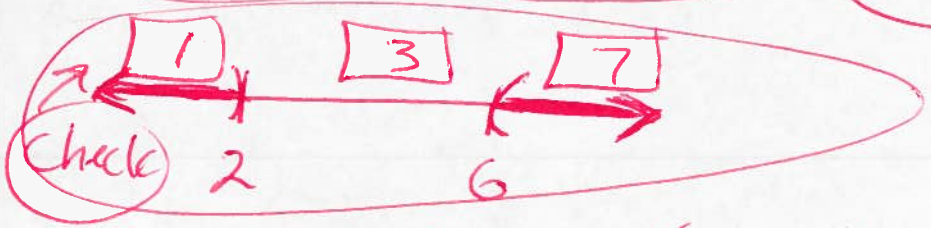
$(x-2)(x-6)>0$

$x-2=0$ or $x-6=0$

$x=2$ or $x=6$

$(-\infty, 2) \cup (6, +\infty)$

$x<2$ or $x>6$



$(x-2)(x-6)>0$

$(1-2)(1-6)>0$

$(-1)(-5)>0$

$5>0$

YES

$(x-2)(x-6)>0$

$(3-2)(3-6)>0$

$(1)(-3)>0$

$-3>0$

NO

$(x-2)(x-6)>0$

$(7-2)(7-6)>0$

$(5)(1)>0$

$5>0$

Yes

(65) Find the domain

$f(x) = \log\left(\frac{x+8}{x-3}\right)$

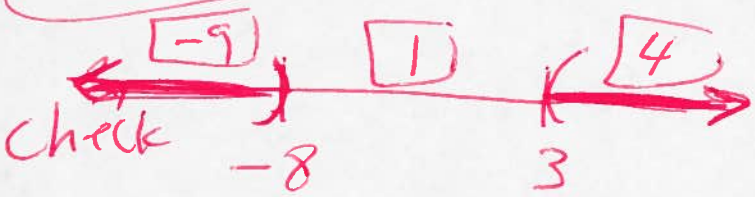
Set $\frac{x+8}{x-3} > 0$

$x+8=0$ or $x-3=0$

$x=-8$ OR $x=3$

$(-\infty, -8) \cup (3, +\infty)$

$x < -8$ OR $x > 3$



$\frac{x+8}{x-3} > 0$

$\frac{-9+8}{-9-3} > 0$

$\frac{-1}{-12} > 0$

$\frac{1}{12} > 0$

Yes

$\frac{x+8}{x-3} > 0$

$\frac{1+8}{1-3} > 0$

$\frac{9}{-2} > 0$

NO

$\frac{x+8}{x-3} > 0$

$\frac{4+8}{4-3} > 0$

$\frac{12}{1} > 0$

$12 > 0$

Yes

(66) Expand $\log_a \frac{x^4\sqrt[3]{x+5}}{(x-2)^2} =$

$\log_a(x^4\sqrt[3]{x+5}) - \log_a(x-2)^2 =$

$\log_a(x^4) + \log_a \sqrt[3]{x+5} - \log_a(x-2)^2 =$

$\log_a(x^4) + \log_a(x+5)^{1/3} - \log_a(x-2)^2 =$

$4\log_a(x) + \frac{1}{3}\log_a(x+5) - 2\log_a(x-2) =$

(67) Expand

$$\log \frac{4x^3\sqrt[3]{3-x}}{5(x+3)^2}$$

(32)

$$\log(4x^3\sqrt[3]{3-x}) - \log(5(x+3)^2) =$$

$$(\log(4)+\log(x^3)+\log\sqrt[3]{3-x}) - (\log(5)+\log(x+3)^2)$$

$$(\log(4)+\log(x^3)+\log(3-x)^{1/3}) - (\log(5)+\log(x+3)$$

$$\log(4)+3\log(x)+\tfrac{1}{3}\log(3-x)-\log(5)-2\log(x+3) =$$

(68) $3\log_b(y)+6\log_b(z) =$ write as a single log

$$\log_b(y^3)+\log_b(z^6) =$$

$$\log_b(y^3z^6) =$$

(69) Evaluate use change of base formula

$$\log_{28}(370) =$$

$$\frac{\ln(370)}{\ln(28)} =$$

$$1.774651882 =$$

(70) $4^{x+10} = 8^{x-2}$ Solve for x

33.

$(2^2)^{x+10} = (2^3)^{x-2}$

$2^{2x+20} = 2^{3x-6}$

Set $2x+20 = 3x-6$

$2x+20-20 = 3x-6-20$

$2x = 3x-26$

$2x-3x = 3x-26-3x$

$-1x = -26$

$\frac{-1x}{-1} = \frac{-26}{-1}$

$x = 26$

(71) $9^{5x} = 3.3$ Solve for x

$\ln(9^{5x}) = \ln(3.3)$

$5x \ln(9) = \ln(3.3)$

$\frac{5x\ln(9)}{(5\ln(9))} = \frac{\ln(3.3)}{(5\ln(9))}$

Use graphing calculator

$x = .1086755064$

(72) $7e^x = 10$ Solve for x

$\frac{7e^x}{7} = \frac{10}{7}$

$e^x = \frac{10}{7}$

$\ln(e^x) = \ln\left(\frac{10}{7}\right)$

$x\ln(e) = \ln\left(\frac{10}{7}\right)$

$x(1) = \ln\left(\frac{10}{7}\right)$

$x = \ln\left(\frac{10}{7}\right)$

Use a graphing calculator

$x = .3566749439$

34

(73.) $4^{x+6} = 7$ Solve for x

$\ln(4^{x+6}) = \ln(7)$

$(x+6)\ln(4) = \ln(7)$

$\frac{(x+6)\ln(4)}{\ln(4)} = \frac{\ln(7)}{\ln(4)}$

$x+6 = \frac{\ln(7)}{\ln(4)}$

$x+6-6 = \frac{\ln(7)}{\ln(4)} - 6$

Use a graphing calculator

$x = \frac{\ln(7)}{\ln(4)} - 6$ OR $x = -4.596322539$

(74) $e^{2x} + e^x - 6 = 0$ Solve for x

$(e^x - 2)(e^x + 3) = 0$

Set $e^x - 2 = 0$ OR $e^x + 3 = 0$

$e^x = 2$ OR $e^x = -3$

$\ln(e^x) = \ln(2)$ OR $\ln(e^x) = \ln(-3)$

$x \ln(e) = \ln(2)$

$x(1) = \ln(2)$

$x = \ln(2)$

$x = .693147180G$

undefined

$\{\ln(2)$ OR $.693147180G\}$

(75) $\log_3(x+4) = 1$ Solve for x (wax on)

$3^1 = x + 4$

$3 = x + 4$

$3 - 4 = x + 4 - 1$

$-1 = x$

$\{-1\}$

55.

(76) $\log_4(x-4) + \log_4(x-10) = 2$

$\log_4(x-4)(x-10) = 2$

(wax on)

$4^2 = (x-4)(x-10)$

$16 = x^2 - 10x - 4x + 40$

$16 = x^2 - 14x + 40$

$0 = x^2 - 14x + 40 - 16$

$0 = x^2 - 14x + 24$

$0 = (x-2)(x-12)$

$x-2=0$ OR $x-12=0$

$x=2$ OR $x=12$

BAD Good

{12}

Ck $x=2$

$\log_4(x-4) + \log_4(x-10) = 2$

$\log_4(2-4) + \log_4(2-10) = 2$

$\log_4(-2) + \log_4(-8) = 2$

undefined undefined

BAD

Ck $x=12$

$\log_4(12-4) + \log_4(12-10) = 2$

$\log_4(8) + \log_4(2) = 2$

Good ✓ Good ✓

Good

(77) $\log_6(x^2-5x)=1$ (Maxon)

37.

$6^1 = x^2-5x$

$6 = x^2-5x$

$0 = x^2-5x-6$

$0 = (x+1)(x-6)$

$x+1=0$ OR $x-6=0$

$x=-1$ Good OR $x=6$

$\{-1, 6\}$

Ck $\log_6((-1)^2-5(-1))=1$

$\log_6((-1)(-1)-5(-1))=1$

$\log_6(1+5)=1$

$\log_6(6)=1$ Good

Ck $\log_6((6)^2-5(6))=1$

$\log_6((6)(6)-5(6))=1$

$\log_6(36-30)=1$

$\log_6(6)=1$

Good

(78) $\log_5(x-1) - \log_5(x-3) = 1$

$\log_5\left(\frac{x-1}{x-3}\right) = 1$

wax on

38.

$5^1 = \frac{x-1}{x-3}$

$5 = \frac{x-1}{x-3}$

$5(x-3) = \frac{x-1}{x-3}(x-3)$

$5x - 15 = x - 1$

$5x - 15 + 15 = x - 1 + 15$

$5x = x + 14$

$5x - x = x + 14 - x$

$4x = 14$

$\frac{4x}{4} = \frac{14}{4}$

$x = \frac{7}{2}$

$\left\{\frac{7}{2}\right\}$

Ck $\log_5\left(\frac{7}{2} - 1\right) - \log_5\left(\frac{7}{2} - 3\right) = 1$

$\log_5(3.5 - 1) - \log_5(3.5 - 3) = 1$

$\log_5(2.5) - \log_5(.5) = 1$

Good Good

(79) $\log(5+x) - \log(x-3) = \log(5)$

$\log \frac{5+x}{x-3} = \log(5)$

$\frac{5+x}{x-3} = 5$

$\left(\frac{5+x}{x-3}\right)(x-3) = 5(x-3)$

$5+x = 5x-15$

$5+x-5 = 5x-15-5$

$x = 5x-20$

$x-5x = 5x-20-5x$

$-4x = -20$

$\frac{-4x}{-4} = \frac{-20}{-4}$

$x = 5$

(39)

$\{5\}$

Ck

$\log(5+(5)) - \log((5)-3) = \log(5)$

$\log(10) - \log(2) = \log(5)$

Good ✓ Good ✓

(80) $\log(x) + \log(x-1) = \log(12)$

40.

$\log(x)(x-1) = \log(12)$

$x(x-1) = 12$

$x^2 - x = 12$

$x^2 - x - 12 = 0$

$(x+3)(x-4) = 0$

$x+3=0$ OR $x-4=0$

$x = -3$ OR $x = 4$

{4}

BAD

Ck

$\log(-3) + \log(-3-1) = \log(12)$

$\log(-3) + \log(-4) = \log(12)$

BAD undefined BAD undefined

Ck $\log(4) + \log(4-1) = \log(12)$

$\log(4) + \log(3) = \log(12)$

Good ✓ Good ✓

(81) $5000 = 2500\left(1+\frac{.08}{4}\right)^{4t}$

$\frac{5000}{2500} = \frac{2500\left(1+\frac{.08}{4}\right)^{4t}}{2500}$

41.

$2 = \left(1+\frac{.08}{4}\right)^{4t}$

$\ln(2) = \ln\left(1+\frac{.08}{4}\right)^{4t}$

$\ln(2) = 4t\ln\left(1+\frac{.08}{4}\right)$

$\frac{\ln(2)}{\left(4\ln\left(1+\frac{.08}{4}\right)\right)} = \frac{4t\ln\left(1+\frac{.08}{4}\right)}{\left(4\ln\left(1+\frac{.08}{4}\right)\right)}$

$\frac{\ln(2)}{\left(4\ln\left(1+\frac{.08}{4}\right)\right)} = t$

Use graphing calculator

$8.750697195 = t$

(82) $205 = 175e^{0.032t}$

$\frac{205}{175} = \frac{175e^{0.032t}}{175}$

42.

$\frac{205}{175} = e^{0.032t}$

$\ln\left(\frac{205}{175}\right) = \ln\left(e^{0.032t}\right)$

$\ln\left(\frac{205}{175}\right) = 0.032t \ln(e)$

$\ln\left(\frac{205}{175}\right) = 0.032t(1)$

$\ln\left(\frac{205}{175}\right) = 0.032t$

$\frac{\ln\left(\frac{205}{175}\right)}{0.032} = \frac{0.032t}{0.032}$

$4.944500163 = t$

$\Rightarrow 1998$

$+ 5$ approx

2003 answer

43.

(83) $504 = 800e^{-0.0077x}$

$\frac{504}{800} = \frac{800e^{-0.0077x}}{800}$

$.63 = e^{-0.0077x}$

$\ln(.63) = \ln(e^{-0.0077x})$

$\ln(.63) = -0.0077x \ln(e)$

$\ln(.63) = -0.0077x(1)$

$\ln(.63) = -0.0077x$

$\frac{\ln(.63)}{-0.0077} = \frac{-0.0077x}{-0.0077}$

$60.00460514 = x$

(84) $A = Pe^{rt}$ double $\Rightarrow$

$200 = 100e^{.025x}$

$\frac{200}{100} = \frac{100e^{.025x}}{100}$

$2 = e^{.025x}$

$\ln(2) = \ln(e^{.025x})$

$\ln(2) = .025x \ln(e)$

$\ln(2) = .025x(1)$

$\ln(2) = .025x$

$\frac{\ln(2)}{.025} = \frac{.025x}{.025}$

$27.72588722 = x$

(85) (0, 29) (10, 39)

1981 1991

44.

$A = 29e^{kt}$

$39 = 29e^{k(10)}$

$39 = 29e^{10k}$

$\frac{39}{29} = \frac{29e^{10k}}{29}$

$\frac{39}{29} = e^{10k}$

$\ln\left(\frac{39}{29}\right) = \ln(e^{10k})$

$\ln\left(\frac{39}{29}\right) = 10k \ln(e)$

$\ln\left(\frac{39}{29}\right) = 10k(1)$

$\ln\left(\frac{39}{29}\right) = 10k$

$\frac{\ln\left(\frac{39}{29}\right)}{10} = \frac{10k}{10}$

$.0296265816 = k$

$.0296265816 = k$

(86) $A = P\left(\frac{1}{2}\right)^{\frac{t}{h}}$

$A = 90\left(\frac{1}{2}\right)^{\frac{t}{710}}$

$A = 90\left(\frac{1}{2}\right)^{\frac{400}{710}}$

$A = 90(1/2)\wedge(400/710)$

$= 60.9043266$

use a graphing calculator

(87) $A = P\left(\frac{1}{2}\right)^{\frac{t}{h}}$

$38 = 100\left(\frac{1}{2}\right)^{\frac{t}{5600}}$

$\frac{38}{100} = \frac{100\left(\frac{1}{2}\right)^{\frac{t}{5600}}}{100}$

$.38 = \left(\frac{1}{2}\right)^{\frac{t}{5600}}$

$\ln(.38) = \ln\left(\frac{1}{2}\right)^{\frac{t}{5600}}$

$\ln(.38) = \frac{t}{5600}\ln\left(\frac{1}{2}\right)$

$\frac{\ln(.38)}{\ln(1/2)} = \frac{\frac{t}{5600}\ln\left(\frac{1}{2}\right)}{\ln(1/2)}$

$\frac{\ln(.38)}{\ln(1/2)} = \frac{t}{5600}$

$\frac{5600\ln(.38)}{\ln(1/2)} = \frac{5600\,t}{5600}$

7817.200587 = t

(88) $f(t) = \dfrac{320}{1+2.2e^{-0.26t}}$

$f(16) = \dfrac{320}{1+2.2e^{-0.26(16)}}$

$f(16) = (320)/(1+2.2e\wedge(-0.26(16)))$

$= 309.377036$

(89.)

$x+y+z = -6$

$x-y+3z = 2$

$3x+y+z = -14$

Graphing Calculator

use Matrix

$$\begin{bmatrix} 1 & 1 & 1 & -6 \\ 1 & -1 & 3 & 2 \\ 3 & 1 & 1 & -14 \end{bmatrix}$$

4 x 3 (rows, columns)

use Matrix Functions

$$\begin{bmatrix} 1 & 0 & 0 & -4 \\ 0 & 1 & 0 & -3 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$

$(x, y, z) = (-4, -3, 1)$

(10) $x+y=13$

$y=x^2-14x+49$ ↘ subst

47.

$x+(x^2-14x+49)=13$

$x+x^2-14x+49=13$

$x^2-13x+49=13$

$x^2-13x+49-13=0$

$x^2-13x+36=0$

$(x-4)(x-9)=0$

$x-4=0$ OR $x-9=0$

$x=4$ OR $x=9$

SUB $x=4$

$x+y=13$

$(4)+y=13$

$4+y-4=13-4$

$y=9$ → $(x,y)=(4,9)$ ✓

$x+y=13$ SUB $x=9$

$(9)+y=13$

$9+y=13$

$9+y-9=13-9$

$y=4$ → $(x,y)=(9,4)$ ✓

(91) $x^2 + y^2 = 61$

$x + y = -11 \longrightarrow y = -11 - x$ subst

$x^2 + (-11-x)^2 = 61$

$x^2 + (-11-x)(-11-x) = 61$

$x^2 + 121 + 11x + 11x + x^2 = 61$

$2x^2 + 22x + 121 = 61$

$2x^2 + 22x + 121 - 61 = 0$

$2x^2 + 22x + 60 = 0$

$\frac{2x^2}{2} + \frac{22x}{2} + \frac{60}{2} = \frac{0}{2}$

$x^2 + 11x + 30 = 0$

$(x+5)(x+6) = 0$

$x+5 = 0$ OR $x+6 = 0$

$x = -5$ OR $x = -6$

48.

subst $x = -5$

$y = -11 - x$

$y = 11 - (-5)$

$y = -11 + 5$

$y = -6$

$(x, y) = (-5, -6)$ ✓✓

subst $x = -6$

$y = -11 - x$

$y = -11 - (-6)$

$y = -11 + 6$

$y = -5$

$(x, y) = (-6, -5)$ ✓✓

(92.) $A=\begin{bmatrix}-3 & 1\\ 2 & 5\end{bmatrix}$ $B=\begin{bmatrix}6 & 2\\ 4 & -1\end{bmatrix}$

$A+B=\begin{bmatrix}3 & 3\\ 6 & 4\end{bmatrix}$ use graphing calculator

(93.) $A=\begin{bmatrix}3 & -3\\ -3 & 9\\ -4 & -6\end{bmatrix}$ $B=\begin{bmatrix}-3 & -6\\ 3 & 2\\ -5 & -3\end{bmatrix}$

$A+B=\begin{bmatrix}0 & -9\\ 0 & 11\\ -9 & -9\end{bmatrix}$ use graphing calculator

(94.) $A=\begin{bmatrix}-1 & 3\\ 3 & 2\end{bmatrix}$ $B=\begin{bmatrix}0 & -2 & 7\\ 1 & -3 & 2\end{bmatrix}$

$A\cdot B=\begin{bmatrix}3 & -7 & -1\\ 2 & -12 & 25\end{bmatrix}$ use graphing calculator

(95.) $A=\begin{bmatrix}3 & -2 & 1\\ 0 & 4 & -3\end{bmatrix}$ $B=\begin{bmatrix}4 & 0\\ -2 & 2\end{bmatrix}$

$A\cdot B=$ undefined

(96) $2x+3y=-4$
$5x+y=-23$ use Cramer's rule

$$x=\frac{\begin{vmatrix}-4 & 3\\ -23 & 1\end{vmatrix}}{\begin{vmatrix}2 & 3\\ 5 & 1\end{vmatrix}}=-5 \qquad y=\frac{\begin{vmatrix}2 & -4\\ 5 & -23\end{vmatrix}}{\begin{vmatrix}2 & 3\\ 5 & 1\end{vmatrix}}=2$$

$(x,y)=(-5,2)$

50.

(97) $A = \begin{bmatrix} 4 & 3 & 4 \\ 4 & 0 & 1 \\ -5 & 0 & 5 \end{bmatrix}$ use a graphing calculator

$\det[A] = -75$

(98) $\sum_{x=3}^{5} (x^2+2) =$

$(3)^2+2) + ((4)^2+2) + ((5)^2+2) = 56$ ✓

OR $\text{sum}(\text{seq}(x^2+2, x, 3, 5, 1)) = 56$ ← use graphing calculator

(99) $(2x+3)^3$ use the Binomial Theorem

$C_{30}(2x)^3(3)^0 + C_{31}(2x)^2(3)^1 + C_{32}(2x)^1(3)^2 + C_{33}(2x)^0(3)^3 =$

$(1)(8x^3)(1) + (3)(4x^2)(3) + (3)(2x)(9) + (1)(1)(27) =$

$8x^3 + 36x^2 + 54x + 27 =$ ✓

(100) $(x+2)^{15}$ Find the 1st three terms.

$C_{150}(x)^{15}(2)^0 + C_{151}(x)^{14}(2)^1 + C_{152}(x)^{13}(2)^2 =$

$(1)(x^{15})(1) + (15)(x^{14})(2) + (105)(x^{13})(4) =$

$x^{15} + 30x^{14} + 420x^{13} =$

(Free Formulas) ~~FAILS~~ A. Alvarez

Sum of Cubes
$A^3 + B^3 = (A + B)(A^2 - AB + B^2)$

Difference of Cubes
$A^3 - B^3 = (A - B)(A^2 + AB + B^2)$

Difference of Squares
$a^2 - b^2 = (a + b)(a - b)$

Slope
$m = \frac{y_1 - y_2}{x_1 - x_2}$

Slope Intercept
$y = mx + b$

Point Slope
$y - y_1 = m(x - x_1)$

Two Point
$y - y_1 = \frac{y_1 - y_2}{x_1 - x_2}(x - x_1)$

Distance
$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

$mid = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Quadratic Formula
$ax^2 + bx + c = 0$
$a = \_\_ \quad b = \_\_ \quad c = \_\_$
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Absolute Value
$|x| = a \quad x = -a \text{ or } x = a$
$|x| < a \quad -a < x < a$
$|x| > a \quad x < -a \text{ or } x > a$

$vertex = \min/\max = \left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

Average Rate of Change $x = A$ to $x = B$ (little, BIG)
$\frac{f(B) - f(A)}{B - A}$

Compounded Continuous (population)
$A = Pe^{rt}$

Compounded monthly, daily
$A = P\left(1 + \frac{r}{N}\right)^{Nt}$

Half Life
$A = P\left(\frac{1}{2}\right)^{\frac{t}{N}}$

DOMAIN
$f(x) = \sqrt{AX+B}$
Set $AX + B \geq 0$

$\sum_{x=a}^{b}(AX+B)$
sum(seq(AX+B, X, a, b, 1))

$(f - g)(x) = f(x) - g(x)$
$(f + g)(x) = f(x) + g(x)$
$(f \cdot g)(x) = f(x) \cdot g(x)$
$\frac{f}{g}(x) = \frac{f(x)}{g(x)}$
$(f \circ g)(x) = f(g(x))$
$(g \circ f)(x) = g(f(x))$

Difference Quotient
$\frac{f(x+h) - f(x)}{h}$

$\ln(A) + \ln(B) = \ln(AB)$
$\ln(A) - \ln(B) = \ln\left(\frac{A}{B}\right)$
$\ln(A^N) = N \ln(A)$
$\ln(e) = 1$
$\ln(1) = 0$
$\ln(A) = \ln(B)$ then $A = B$

$2^0 = 1$
$\frac{0}{2} = 0$
$\frac{2}{0} = \text{undef}$
$\frac{0}{0}$ indeterminant

Change of base
$\log_b(A) = \frac{\ln(A)}{\ln(b)}$

$\log_b(b) = 1$

$\log_b(y) = x$ then $b^x = y$

$A^x = A^y$ then $x = y$

$i^2 = -1$

$\sqrt{-1} = i$ same BASE powers rule

$nCr = \frac{n!}{r!(n-r)!}$

$nPr = \frac{n!}{(n-r)!}$

If $\log_b(AX+B) = \log_b(CX+D)$ then $AX+B = CX+D$

If $\log_b(AX+B) = C$ then $b^C = AX+B$

DOMAIN
$f(x) = \log(AX+B)$
Set $AX + B > 0$

If $b^{AX+B} = b^{CX+D}$ then $AX+B = CX+D$

$(A+B)^N = {}_{N}C_{0}(A)^N(B)^0 + {}_{N}C_{1}(A)^{N-1}(B)^1 + \ldots + {}_{N}C_{N}(A)^0(B)^N$