1) $8x^2+10x-7=0$ $8\cdot1$ $2\cdot4$ $1\cdot7$ possibly

Math 1314 37 step
06-3-19

Done 400
Done
done
Done

$(2x-1)(4x+7)=0$

set $2x-1=0$ OR $4x+7=0$

$2x-1+1=0+1$ OR $4x+7-7=0-7$

$2x=1$ OR $4x=-7$

$\frac{\cancel{2}x}{\cancel{2}}=\frac{1}{2}$ OR $\frac{\cancel{4}x}{\cancel{4}}=\frac{-7}{4}$

$x=\frac{1}{2}$ OR $x=\frac{-7}{4}$

use Quad formula

$8x^2+10x-7=0$

$a=1,\ b=10,\ c=-7$

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

$$x=\frac{-(10)\pm\sqrt{(10)^2-4(8)(-7)}}{2(8)}$$

$$x=\frac{-10\pm\sqrt{100+224}}{16}$$

$$x=\frac{-10\pm\sqrt{324}}{16}$$

$$x=\frac{-10\pm18}{16}$$

$x=\frac{-10-18}{16}$ OR $x=\frac{-10+18}{16}$

$x=\frac{-28}{16}$ OR $x=\frac{8}{16}$

$x=\frac{\cancel{4}(-7)}{\cancel{4}(4)}$ OR $x=\frac{\cancel{8}(1)}{\cancel{8}(2)}$

$x=\frac{-7}{4}$ $x=\frac{1}{2}$

answer

$\left\{-\frac{7}{4},\ \frac{1}{2}\right\}$

2. $4x^2 = 11x + 45$

4.1 | 45.1
2.2 | 15.3
 | 9.5

Possible

2

$4x^2 - 11x - 45 = 0$

$(4x+9)(x-5) = 0$

set $4x+9=0$ or $x-5=0$

$4x+\cancel{9}-\cancel{9}=0-9$ or $x-5+5=0+5$

$4x=-9$ or $x=5$

$\frac{4x}{4} = \frac{-9}{4}$

$x = -9/4$

use Quad formula

$4x^2 - 11x - 45 = 0$

$a=4,\ b=-11,\ c=-45$

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

$x = \frac{-(-11) \pm \sqrt{(-11)^2 - 4(4)(-45)}}{2(4)}$

$x = \frac{11 \pm \sqrt{121+720}}{8}$

$x = \frac{11 \pm \sqrt{841}}{8}$

$x = \frac{11 \pm 29}{8}$

$x = \frac{11-29}{8}$ or $x = \frac{11+29}{8}$

$x = \frac{-18}{8}$ or $x = \frac{40}{8}$

$x = \frac{\cancel{2}(-9)}{\cancel{2}(4)}$ or $x = \frac{\cancel{8}(5)}{\cancel{8}}$

$x = \frac{-9}{4}$ or $x = 5$

answer

$\left\{-\frac{9}{4}, 5\right\}$

(3.) $x^2 - 2x + 26 = 0$

$1x^2 - 2x + 26 = 0$

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

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

formula

$\sqrt{-1} = i$

$\sqrt{-4} = 2i$

$\sqrt{-9} = 3i$

$\sqrt{-16} = 4i$

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

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

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

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

$x = 1 \pm 5i$

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

answer

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

4. $4x^2-16x+16=0$

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

$4(x-2)(x-2)=0$

4.1
2.2
possible

4

~~$4=0$~~ OR $x-2=0$ OR $x-2=0$

OR $x-\cancel{2}+\cancel{2}=0+2$ OR $x-2+2=0+2$

$x=2$ OR $x=2$

answer

$\{2\}$

5.

$\sqrt{3x+28} = x+6$

$(\sqrt{3x+28})^2 = (x+6)^2$

$3x+28 = (x+6)(x+6)$

$3x+28 = x^2+6x+6x+36$

$3x+28 = x^2+12x+36$

$0 = x^2+12x+36-3x-28$

$0 = x^2+9x+8$

$0 = (x+1)(x+8)$

Possible
$8 \cdot 1$
$2 \cdot 4$

so $x+1=0$ OR $x+8=0$

$x+1-1=0-1$ OR $x+8-8=0-8$

$x=-1$ Good or ~~$x=-8$~~ BAD

Ck

$\sqrt{3x+28} = x+6$

$\sqrt{3(-1)+28} = (-1)+6$

$\sqrt{-3+28} = -1+6$

$\sqrt{25} = 5$

$5 = 5$

Good

Ck

$\sqrt{3x+28} = x+6$

$\sqrt{3(-8)+28} = (-8)+6$

$\sqrt{-24+28} = -8+6$

$\sqrt{4} = -2$

$2 \neq -2$

BAD

Answer

$\{-1\}$

5

6.

$f(x) = \begin{cases} x+1 & \text{if } x < -2 \\ x-1 & \text{if } x \geq -2 \end{cases}$ graph

6

$f(x) = x+1$

$f(-3) = -3+1$

$f(-3) = -2$

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

$f(-2) = -1$

x	$f(x)$	
-3	-2	
-2	-1	OPEN

$f(x) = x-1$

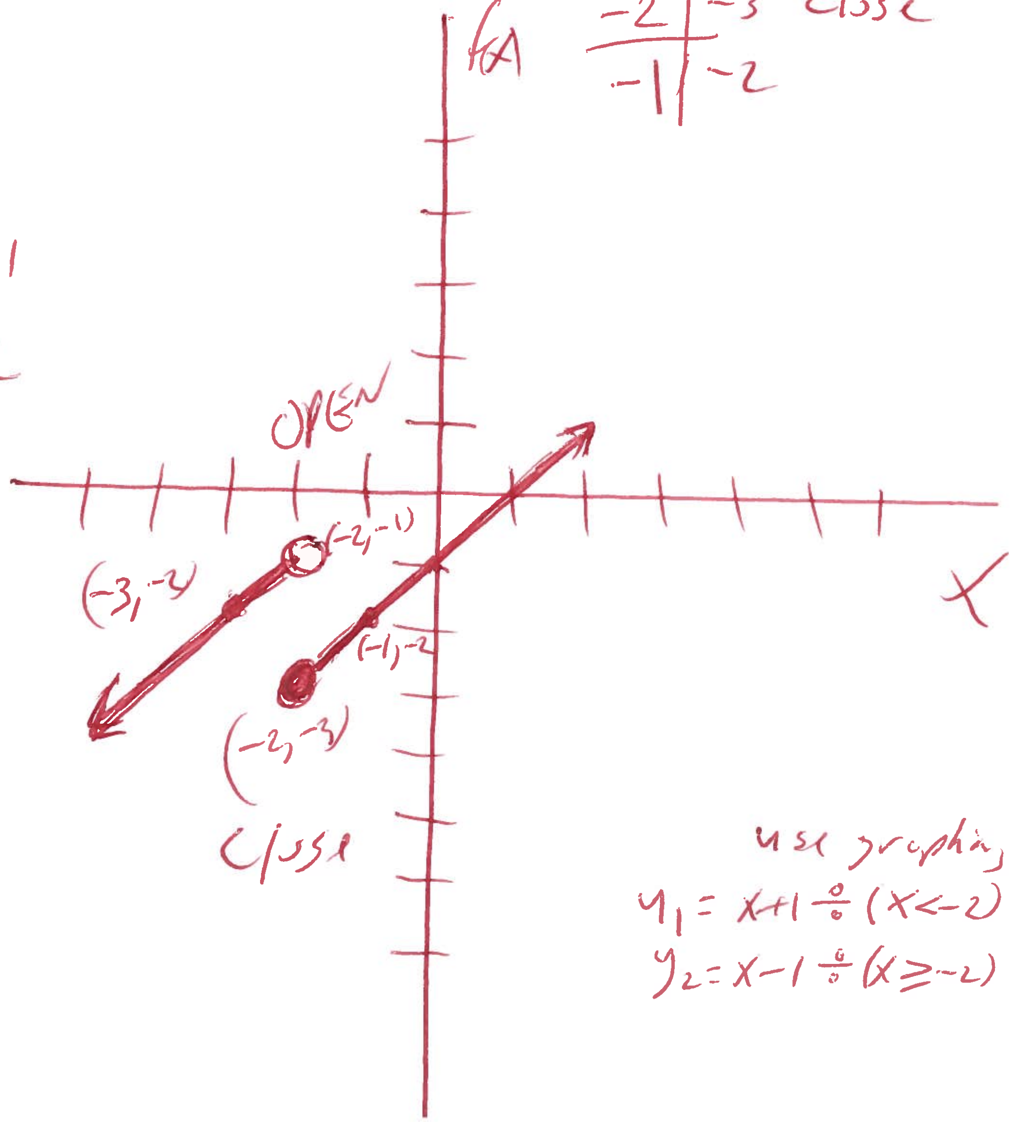
$f(-2) = -2-1$

$f(-2) = -3$

$f(-1) = -1-1$

$f(-1) = -2$

x	$f(x)$	
-2	-3	close
-1	-2	



use graphing calculator

$y_1 = x+1 \div (x<-2)$ open

$y_2 = x-1 \div (x \geq -2)$ close

7. $f(x) = x^2 - 6x + 6$ 1

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

$$\frac{((x+h)^2 - 6(x+h) + 6) - (x^2 - 6x + 6)}{h} =$$

$$\frac{(x+h)(x+h) - 6x - 6h + 6 - x^2 + 6x - 6}{h} =$$

$$\frac{x^2 + xh + xh + h^2 - 6x - 6h + 6 - x^2 + 6x - 6}{h} =$$

$$\frac{x^2 + 2xh + h^2 - 6x - 6h + 6 - x^2 + 6x - 6}{h} =$$

$$\frac{\cancel{x^2} + 2xh + h^2 \cancel{- 6x} - 6h \cancel{+ 6} \cancel{- x^2} \cancel{+ 6x} \cancel{- 6}}{h} =$$

$$\frac{2xh + h^2 - 6h}{h} =$$

$$\frac{\cancel{h}(2x + h - 6)}{\cancel{h}} =$$

$$2x + h - 6 =$$

8 find the domain

$f(x) = \sqrt{20-5x}$

formula domain

$f(x) = \sqrt{Ax+B}$

set $Ax+B \geq 0$

set $20-5x \geq 0$

$\cancel{20}-5x-\cancel{20} \geq 0-20$

$-5x \geq -20$

$\frac{-5x}{-5} \leq \frac{-20}{-5}$

divide by a negative and turn the alligator around

$x \leq 4$

$(-\infty, 4]$

(9) $f(x) = 4x^2 + 15x - 54$ $\quad g(x) = x+6$

9

$f+g =$

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

$(4x^2+15x-54) + (x+6) =$

$4x^2 + 15x - 54 + x + 6 =$

$4x^2 + 16x - 48 =$ domain $(-\infty, \infty)$

$f-g =$

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

$(4x^2+15x-54) - (x+6) =$

$4x^2 + 15x - 54 - x - 6 =$

$4x^2 + 14x - 60 =$ domain $(-\infty, \infty)$

$fg =$

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

$(4x^2+15x-54)(x+6)$

$4x^3 + 24x^2 + 15x^2 + 90x - 54x - 324 =$

$4x^3 + 39x^2 + 36x - 324 =$ domain $(-\infty, \infty)$

$\frac{f}{g} =$

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

$\frac{4x^2+15x-54}{x+6} =$

$\frac{(4x-9)\cancel{(x+6)}}{\cancel{(x+6)}} =$ $4x - 9 =$

domain $x+6 \neq 0$

$x+6-6 \neq 0-6$

$x \neq -6$

domain

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

4.1
2.2

54.1
27.2
9.6
3.18

6.8

(10) $f(x) = 5 - x \qquad g(x) = 3x^2 + x + 6$

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

$f(g(x)) =$

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

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

$-3x^2 - x - 1 =$ ✓

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

$g(f(x)) =$

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

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

$3(25 - 5x - 5x + x^2) + (5-x) + 6 =$

$3(25 - 10x + x^2) + (5-x) + 6 =$

$75 - 30x + 3x^2 + 5 - x + 6 =$ ✓

$3x^2 - 31x + 86 =$

$(f \circ g)(x) = -3x^2 - x - 1$

$(f \circ g)(2) = -3(2)^2 - (2) - 1$

$(f \circ g)(2) = -3(2)(2) - (2) - 1$

$(f \circ g)(2) = -3(4) - (2) - 1$

$(f \circ g)(2) = -12 - 2 - 1$ ✓

$(f \circ g)(2) = -15$

$(g \circ f)(x) = 3x^2 - 31x + 86$

$(g \circ f)(2) = 3(2)^2 - 31(2) + 86$

$(g \circ f)(2) = 3(2)(2) - 31(2) + 86$

$(g \circ f)(2) = 3(4) - 31(2) + 86$

$(g \circ f)(2) = 12 - 62 + 86$

$(g \circ f)(2) = 36$ ✓

10

11, $(6,7)$ and $(3,3)$

$x_1 \quad y_1 \qquad x_2 \quad y_2$

find distance

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

$$d=\sqrt{((6)-(3))^2+((7)-(3))^2}$$

$$d=\sqrt{(6-3)^2+(7-3)^2}$$

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

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

$$d=\sqrt{25}$$

$$d=5$$

11

12

(6, 2) and (8, 4)

x_1 y_1 x_2 y_2

find midpoint

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

$$\text{Midpoint} = \left(\frac{(6)+(8)}{2}, \frac{(2)+(4)}{2}\right)$$

$$\text{Midpoint} = \left(\frac{6+8}{2}, \frac{2+4}{2}\right)$$

$$\text{Midpoint} = \left(\frac{14}{2}, \frac{6}{2}\right)$$

$$\text{Midpoint} = (7, 3)$$

(13) $x^2+y^2+2x+8y-8=0$ graph

17

$x^2+2x+y^2+8y=8$ rewrite

complete the square 2

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

$x^2+2x+(1)^2+y^2+8y+(4)^2=8+(1)^2+(4)^2$

$x^2+2x+1+y^2+8y+16=8+1+16$

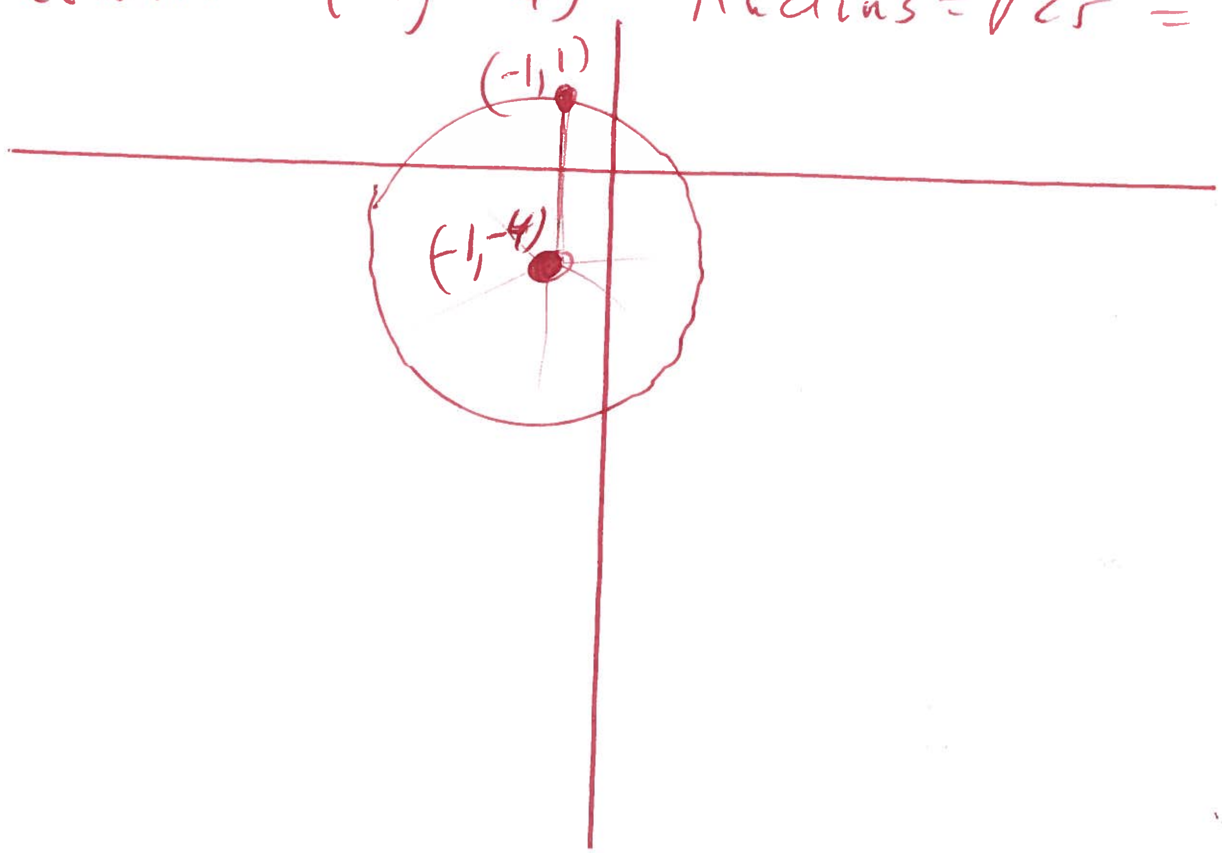
$\underbrace{x^2+2x+1}+\underbrace{y^2+8y+16}=25$

$(x+1)(x+1)+(y+4)(y+4)=25$

$(x+1)^2+(y+4)^2=25$

opp opp

CENTER $=(-1,-4)$ Radius $=\sqrt{25}=5$



14

(14) $f(x) = 2(x+1)^2 - 1$ graph

Shift Left 1

Shift down 1

Original $y = x^2$

x	$f(x)$
-2	1
-1	-1
0	1

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

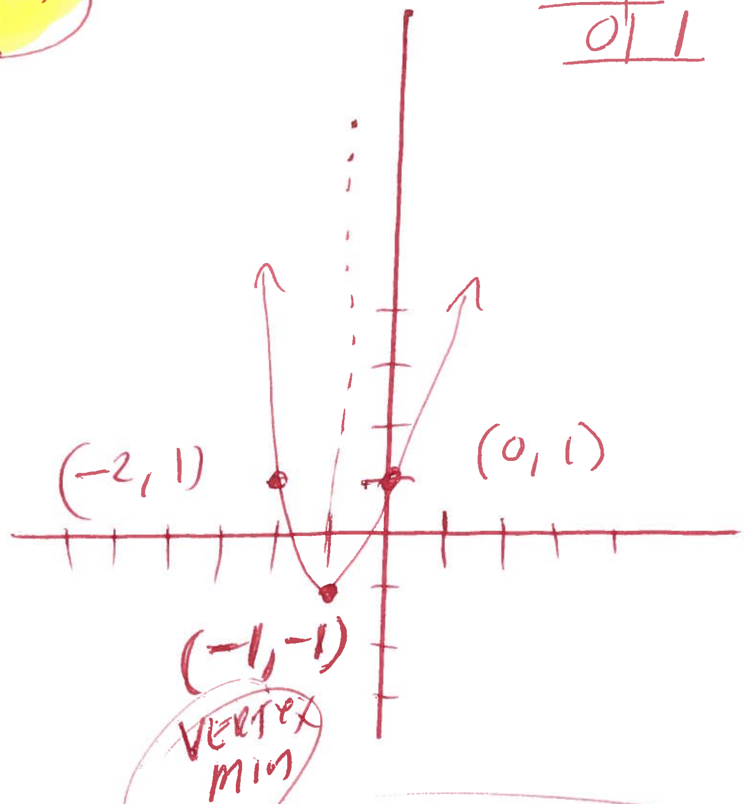
$f(-2) = 2(-1)^2 - 1$

$f(-2) = 2(-1)(-1) - 1$

$f(-2) = 2(1) - 1$

$f(-2) = 2 - 1$

$f(-2) = 1$



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

$f(-1) = 2(0)^2 - 1$

$f(-1) = 2(0)(0) - 1$

$f(-1) = 2(0) - 1$

$f(-1) = 0 - 1$

$f(-1) = -1$

Vertex $= (-1, -1)$

axis of symmetry $x = -1$

domain $(-\infty, \infty)$

Range $[-1, \infty)$

$f(0) = 2(0+1)^2 - 1$

$f(0) = 2(1)^2 - 1$

$f(0) = 2(1)(1) - 1$

$f(0) = 2(1) - 1$

$f(0) = 2 - 1$

$f(0) = 1$

OR

Use graphing calculator

Xmin = -12

Xmax = 12

Xscl = 1

Ymin = -10

Ymax = 10

Yscl = 1

$y_1 = 2(x+1)^2 - 1$

15 $y = f(x) = x^2 + 4x + 3$

find x-intercept let $y = 0$

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

$0 = (x+1)(x+3)$

$x+1 = 0$ or $x+3 = 0$

$x+1-1 = 0-1$ or $x+3-3 = 0-3$

$x = -1$ or $x = -3$

x-intercepts $(-1, 0), (-3, 0)$

axis of symmetry $x = -2$

Domain $(-\infty, \infty)$

Range $[-1, \infty)$

find y-intercept let $x = 0$

$y = f(0) = (0)^2 + 4(0) + 3$

$f(0) = (0)(0) + 4(0) + 3$

$f(0) = 0 + 0 + 3$

$f(0) = 3$

y-intercept $(0, 3)$

min

Find VERTEX min

$f(x) = 1x^2 + 4x + 3$

$a = 1, \ b = 4, \ c = 3$

max

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

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

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

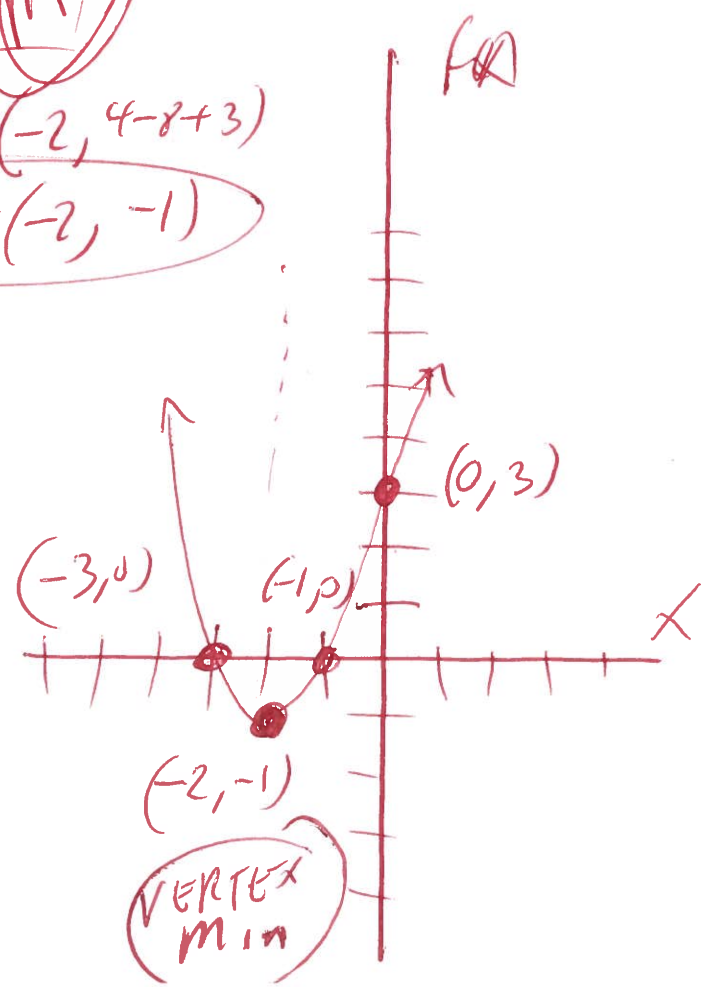
$\text{Vertex} = (-2, f(-2))$

$\text{Vertex} = (-2, (-2)^2 + 4(-2) + 3)$

$\text{Vertex} = (-2, (-2)(-2) + 4(-2) + 3)$

$\text{Vertex} = (-2, 4 - 8 + 3)$

$\text{Vertex} = (-2, -1)$



16. $y = f(x) = 8x - x^2 - 7$

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

Find x-intercept let $y = 0$

$0 = -x^2 + 8x - 7$

$0 = -1(x^2 - 8x + 7)$

$0 = -1(x - 1)(x - 7)$

set $-1 \neq 0$ $\quad x - 1 = 0$ or $x - 7 = 0$ $\quad (1, 0), (7, 0)$

$x - 1 + 1 = 0 + 1$ OR $x - 7 + 7 = 0 + 7$

$x = 1$ or $x = 7$

Find y-intercept let $x = 0$

$f(0) = -(0)^2 + 8(0) - 7$

$f(0) = -(0)(0) + 8(0) - 7$

$f(0) = -(0) + 8(0) - 7$

$f(0) = 0 + 0 - 7$ $\quad (0, -7)$

$f(0) = -7$

Find VERTEX Max

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

$a = -1, \; b = 8, \; c = -7$ $\quad$ MAX

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

Vertex $= \left(\frac{-(8)}{2(-1)}, f\left(\frac{-(8)}{2(-1)}\right)\right)$

Vertex $= \left(\frac{-8}{-2}, f\left(\frac{-8}{-2}\right)\right)$

Vertex $= (4, f(4))$

Vertex $= (4, -1(4)^2 + 8(4) - 7)$

Vertex $= (4, -1(4)(4) + 8(4) - 7)$

Vertex $= (4, -1(16) + 8(4) - 7)$

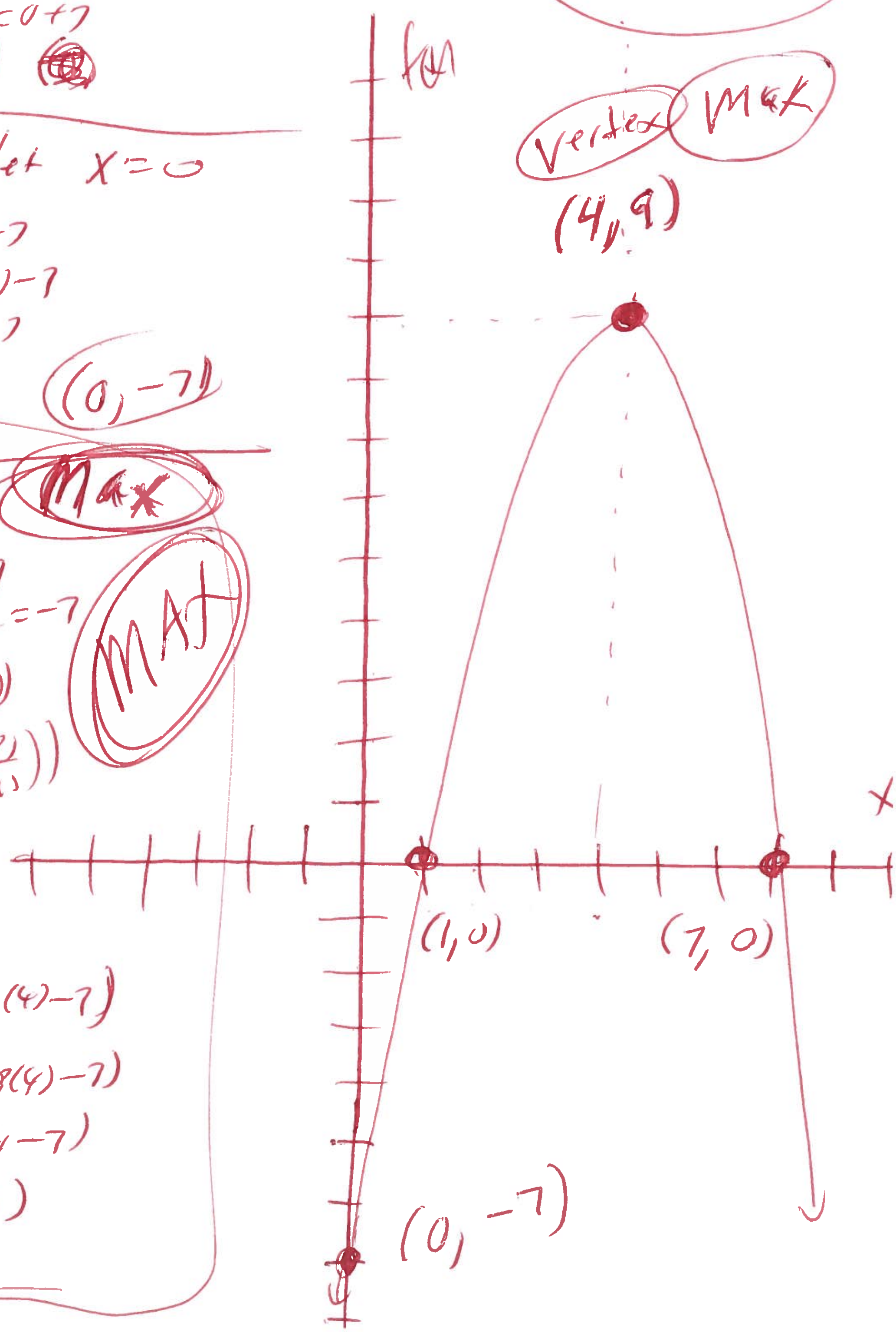
Vertex $= (4, -16 + 32 - 7)$

Vertex $= (4, 9)$

axis of symmetry $x = 4$

Domain $(-\infty, \infty)$

Range $(-\infty, 9]$



(17) $1x^3 - 5x^2 + 2x + 8 = 0$ given $x = -1$ is a zero 17

use synthetic division

$$\begin{array}{r|rrrr} -1 & 1 & -5 & 2 & 8 \\ & & -1 & 6 & -8 \\ \hline & 1 & -6 & 8 & 0 \end{array}$$

$\downarrow \quad \downarrow \quad \downarrow$

$x^2 - 6x + 8 = 0$ rewrite

Possible
8.1
2x4

$(x-2)(x-4) = 0$

so $x-2=0$ OR $x-4=0$

$x-2+2=0+2$ OR $x-4+4=0+4$

$x=2$ or $x=4$

$\{-1, 2, 4\}$

18 $f(x) = 3x^3 - 7x^2 - 75x + 175$ 18

Possible ration zeros $\dfrac{\text{last}}{\text{first}} = \dfrac{\pm 175}{3}$

$$\frac{\pm 175, \pm 35, \pm 7, \pm 25, \pm 5, \pm 1}{\pm 3, \pm 1} =$$

$\pm 1, \pm 5, \pm 25, \pm 7, \pm 35, \pm 175, \pm \frac{1}{3}, \pm \frac{5}{3}, \pm \frac{25}{3}, \pm \frac{7}{3}, \pm \frac{35}{3}, \pm \frac{175}{3}$

$$\begin{array}{r|rrrr} 5 & 3 & -7 & -75 & 175 \\ & & 15 & 40 & -175 \\ \hline & 3 & 8 & -35 & 0 \end{array}$$

use synthetic division

$3x^2 + 8x - 35 = 0$ rewrite $3 \cdot 1$ possible $35 \cdot 1$ $7 \cdot 5$

$(3x - 7)(x + 5) = 0$

set $3x - 7 = 0$ OR $x + 5 = 0$

$3x - 7 + 7 = 0 + 7$ OR $x + \cancel{5} - \cancel{5} = 0 - 5$

$3x = 7$ OR $x = -5$

$\frac{\cancel{3}x}{\cancel{3}} = \frac{7}{3}$

$x = \frac{7}{3}$

$\left\{ 5, \frac{7}{3}, -5 \right\}$

19

19. $1x^3 - 3x^2 - 25x + 75 = 0$

possible rational zeros $\dfrac{\text{last}}{\text{first}} = \dfrac{\pm 75}{\pm 1}$

$\dfrac{\pm 75, \pm 25, \pm 3, \pm 1, \pm 5}{\pm 1}$

$\pm 75, \pm 25, \pm 3, \pm 1, \pm 5$

$$\begin{array}{r|rrrr} 5 & 1 & -3 & -25 & 75 \\ & & 5 & 10 & -75 \\ \hline & 1 & 2 & -15 & 0 \end{array}$$

rc

use synthetic division

(5, 1)

(3, 5)

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

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

Let $x - 3 = 0$ or $x + 5 = 0$

$x - 3 + 3 = 0 + 3$ or $x + \cancel{5} - \cancel{5} = 0 - 5$

$x = 3$ or $x = -5$

$\{5, 3, -5\}$

(20) $f(x) = -x^3 + 3x^2 + 13x - 15$ graph

Use graphing Calculator

Xmin = −12
Xmax = 12
X Scl = 1
ymin = −30
ymax = 30
y Scl = 1

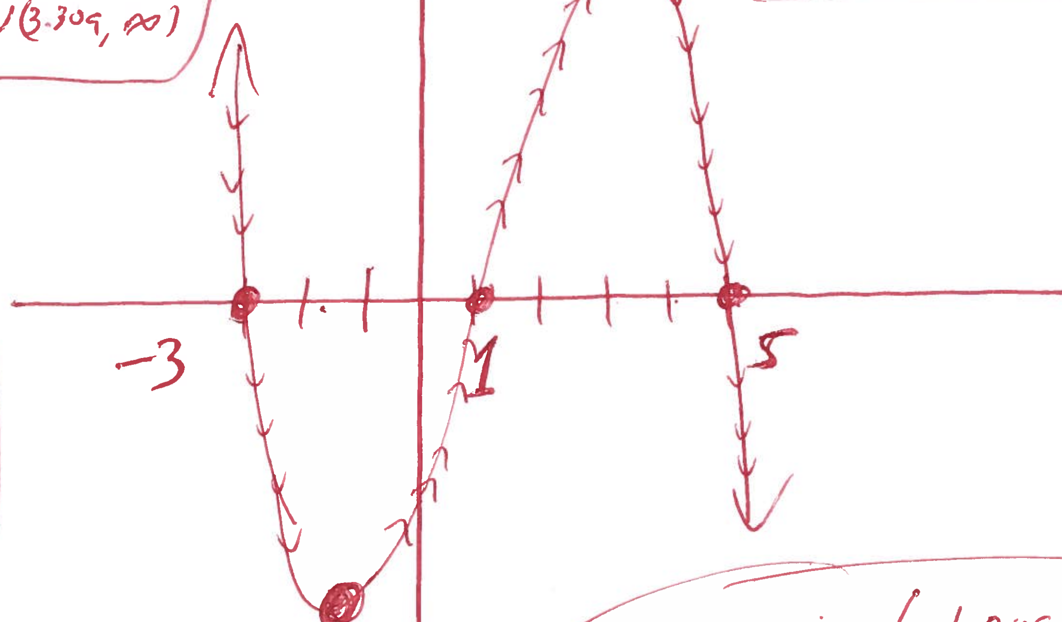
$y_1 = -x^3 + 3x^2 + 13x - 15$

Increasing $(-1.309,\ 3.309)$

decreasing $(-\infty, -1.309) \cup (3.309, \infty)$

Local max $(3.309,\ 24.634)$

Go left to right always



min Local $(-1.309,\ -24.634)$

increasing $(-1.309,\ 3.309)$
decreasing $(-\infty,\ -1.309) \cup (3.309,\ \infty)$

21.

$f(x) = \dfrac{6x^2 - 5x + 6}{x - 2}$ find Slant

21

$$\begin{array}{r|rrr} 2 & 6 & -5 & 6 \\ & & 12 & 14 \\ \hline & 6 & 7 & 20 \end{array}$$ rem

use synthetic division

$y = 6x + 7$ Slant

22

$f(x) = \frac{x-7}{x^2-9x+14}$ find vertical

22

$f(x) = \frac{x-7}{(x-2)(x-7)}$ factor first

$f(x) = \frac{1(\cancel{x-7})}{(x-2)(\cancel{x-7})}$

$f(x) = \frac{1}{x-2}$

hole at

$x-7=0$

$x-7+7=0+7$

$x=7$

set $x-2=0$

$x-2+2=0+2$

$x=2$

vertical asym $= 2$

23 $f(x) = \frac{15x}{4x^2+1}$ find horizontal

23

$$\lim_{x\to\infty} \frac{15x}{4x^2+1} =$$

Formula

$$\lim_{x\to\infty} \frac{1}{x^n} = 0$$

$$\lim_{x\to\infty} \left(\frac{15x}{4x^2+1}\right)\left(\frac{\frac{1}{x^2}}{\frac{1}{x^2}}\right) =$$

$$\lim_{x\to\infty} \frac{\frac{15x}{x^2}}{\frac{4\cancel{x^2}}{\cancel{x^2}} + \frac{1}{x^2}} =$$

$$\lim_{x\to\infty} \frac{\frac{15}{x}}{4 + \frac{1}{x^2}} =$$

$$\frac{0}{4+0} =$$

$$\frac{0}{4} =$$

$$0 =$$

$y = 0$ horizontal asym

24. $g(x) = \dfrac{15x^2}{5x^2+4}$ find horizontal

24

$$\lim_{x\to\infty} \frac{15x^2}{5x^2+4} =$$

$$\lim_{x\to\infty} \left(\frac{15x^2}{5x^2+4}\right)\left(\frac{\frac{1}{x^2}}{\frac{1}{x^2}}\right) = \text{mult}$$

$$\lim_{x\to\infty} \frac{\frac{15x^2}{x^2}}{\frac{5x^2}{x^2}+\frac{4}{x^2}} =$$

formula

$$\lim_{x\to\infty} \frac{1}{x^n} = 0$$

$$\lim_{x\to\infty} \frac{15}{5+\frac{4}{x^2}}$$

$$\frac{15}{5+0} =$$

$$\frac{15}{5} =$$

$$3 =$$

$y = 3$ horizontal asym

25. $f(x)=\log(14-x)$ find domain

formula domain

$f(x)=\log(Ax+B)$

set $Ax+B>0$

set $14-x>0$

$\cancel{14}-x-\cancel{14}>0-14$

$-x>-14$

$\frac{-x}{-1}<\frac{-14}{-1}$

$x<14$

divide by a negative and turn the alligator around

$(-\infty, 14)$

(26) $\log_b\left(\frac{x^2y}{z^9}\right)$ expand

26

$$\log_b(x^2y) - \log_b(z^9) =$$

$$\log_b(x^2) + \log_b(y) - \log_b(z^9) =$$

$$2\log_b(x) + \log_b(y) - 9\log_b(z) =$$

formulas

$$\log_b\left(\frac{A}{B}\right) = \log_b(A) - \log_b(B)$$

$$\log_b(AB) = \log_b(A) + \log_b(B)$$

$$\log_b(A^N) = N\log_b(A)$$

27) $\ln\left(\frac{x^2\sqrt{x^2+2}}{(x+2)^6}\right) =$

27

$\ln(x^2\sqrt{x^2+2}) - \ln(x+2)^6 =$

$\ln(x^2) + \ln\sqrt{x^2+2} - \ln(x+2)^6 =$

$\ln(x^2) + \ln(x^2+2)^{1/2} - \ln(x+2)^6 =$ rewrite

$2\ln(x) + \frac{1}{2}\ln(x^2+2) - 6\ln(x+2) =$

formulas

$\ln\left(\frac{A}{B}\right) = \ln(A) - \ln(B)$

$\ln(AB) = \ln(A) + \ln(B)$

$\ln(A^N) = N\ln(A)$

28.

$4^{x+2} = 16^{x-4}$

28

$(2^2)^{x+2} = (2^4)^{x-4}$ rewrite

$\cancel{2}^{2x+4} = \cancel{2}^{4x-16}$

formula

$x^a = x^b$

$a = b$

$2x+4 = 4x-16$

$2x+\cancel{4}-\cancel{4} = 4x-16-4$

$2x = 4x-20$

$2x-4x = \cancel{4x}-20-\cancel{4x}$

$-2x = -20$

$\frac{-2x}{-2} = \frac{-20}{-2}$

$x = 10$

29

$3^{(x-2)} = 469$

$\ln\left(3^{(x-2)}\right) = \ln(469)$

$(x-2)\ln(3) = \ln(469)$

$\frac{(x-2)\cancel{\ln(3)}}{\cancel{\ln(3)}} = \frac{\ln(469)}{\ln(3)}$

$x - 2 = \frac{\ln(469)}{\ln(3)}$

$x \cancel{-2} \cancel{+2} = \frac{\ln(469)}{\ln(3)} + 2$

$x = \frac{\ln(469)}{\ln(3)} + 2$

OR

$x = 7.598519907$

OR Round

$x = 7.60$

formula

$\ln(A^N) = N\ln(A)$

29

(30) $\log_5(x) + \log_5(4x-1) = 1$

$\log_5 (x)(4x-1) = 1$

Formula
$\log_5(A) + \log_5(B) = \log_5(AB)$

30

$5^1 = (x)(4x-1)$

Possibly
4·1
2·2
5·1

$5 = 4x^2 - x$

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

$0 = (4x-5)(x+1)$

$4x - 5 = 0$ or $x + 1 = 0$

$4x - 5 + 5 = 0 + 5$ or $x + 1 - 1 = 0 - 1$

$4x = 5$

$\frac{4x}{4} = \frac{5}{4}$ or $\cancel{x = -1}$ BAD

$x = \frac{5}{4}$

Ck Good

$\log_5(x) + \log_5(4x-1) = 1$

$\log_5\left(\frac{5}{4}\right) + \log_5\left(4\left(\frac{5}{4}\right) - 1\right) = 1$

$\log_5\left(\frac{5}{4}\right) + \log_5(5-1) = 1$

$\log_5\left(\frac{5}{4}\right) + \log_5(4) = 1$

Good Good

$\log_5(x) + \log_5(4x-1) = 1$

$\log_5(-1) + \log_5(4(-1)-1) = 1$

$\log_5(-1) + \log_5(-4-1) = 1$

$\log_5(\cancel{-1}) + \log_5(\cancel{-5}) = 1$

BAD BAD

answer $\left\{\frac{5}{4}\right\}$

31

$\log_4(x-4) + \log_4(x+56) = 4$

formula

$\log_4(A) + \log_4(B)$

$\log_4(AB)$

$\log_4 (x-4)(x+56) = 4$

$4^4 = (x-4)(x+56)$

$256 = x^2 + 56x - 4x - 224$

$256 = x^2 + 52x - 224$

$0 = x^2 + 52x - 224 - 256$

$0 = x^2 + 52x - 480$

Possible

60 · 8

$0 = (x-8)(x+60)$

$x - 8 = 0$ or $x + 60 = 0$

$x - 8 + 8 = 0 + 8$ or $x + 60 - 60 = 0 - 60$

$x = 8$ or $\cancel{x = -60}$

Good BAD

ck $\log_4(x-4) + \log_4(x+56) = 4$

$\log_4(8-4) + \log_4(8+56) = 4$

$\log_4(4) + \log_4(64) = 4$

Good Good

$\log_4(-60-4) + \log_4(-60+56) = 4$

$\log_4(\cancel{-64}) + \log_4(\cancel{-4}) = 4$

BAD BAD

Answer $\{8\}$

32

$$\log_6(x+25) - \log_6(x-10) = 2$$

32

$$\log_6\left(\frac{x+25}{x-10}\right) = 2$$

Formula

$$\log_6(A) - \log_6(B) =$$

$$\log_6\left(\frac{A}{B}\right) =$$

$$6^2 = \frac{x+25}{x-10}$$

$$36 = \frac{x+25}{x-10}$$

$$\frac{36}{1} = \frac{x+25}{x-10}$$

$36(x-10) = 1(x+25)$ cross mult

$$36x - 360 = 1x + 25$$

$$36x \cancel{-360 + 360} = 1x + 25 + 360$$

$$36x = 1x + 385$$

$$36x - 1x = \cancel{1x} + 385 \cancel{- 1x}$$

$$35x = 385$$

$$\frac{35x}{35} = \frac{385}{35}$$

$x = 11$ Ck

answer

$\{11\}$

$$\log_6(x+25) - \log_6(x-10) = 2$$

$$\log_6(11+25) - \log_6(11-10) = 1$$

$$\log_6(36) - \log_6(1) = 1$$

Good Good

33

$\log(x) + \log(x+4) = \log(45)$

formula

$\log(A) + \log(B) = \log(AB)$

$\log(x)(x+4) = \log(45)$

33

$\log(A) = \log B$

$A = B$

possible

9.5

$x(x+4) = 45$

$x^2 + 4x = 45$

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

$(x-5)(x+9) = 0$

Let $x - 5 = 0$ or $x + 9 = 0$

$x - 5 + 5 = 0 + 5$ or $x + 9 - 9 = 0 - 9$

$x = 5$ or $x = -9$

Good

ck $\log(x) + \log(x+4) = \log(45)$

$\log(5) + \log(5+4) = \log(45)$

$\log(5) + \log(9) = \log(45)$

Good Good Good

ck $\log(-9) + \log(-9+4) = \log(45)$

$\log(-9) + \log(-5) = \log(45)$

BAD BAD

answer

$\{5\}$

34

$A = P\left(1+\frac{r}{n}\right)^{nt}$ $P = 12500$, $A = 15000$,

$r = 6.25\% = .0625$ 34

$t = ?$ $n = 4$

$$15000 = 12500\left(1+\frac{.0625}{4}\right)^{4t}$$

$$15000 = 12500(1+.015625)^{4t}$$

$$15000 = 12500(1.015625)^{4t}$$

$$\frac{15000}{12500} = \frac{12500(1.015625)^{4t}}{12500}$$

$$1.2 = (1.015625)^{4t}$$

$$\ln(1.2) = \ln(1.015625)^{4t}$$

$$\ln(1.2) = 4t\ln(1.015625)$$

$$\frac{\ln(1.2)}{\ln(1.015625)} = \frac{4t\cancel{\ln(1.015625)}}{\cancel{\ln(1.015625}}$$

$$\frac{\ln(1.2)}{\ln(1.015625)} = 4t$$

$$11.75950485 = 4t$$

$$\frac{11.7595048}{4} = \frac{\cancel{4}t}{\cancel{4}}$$

$$2.939876213 = t$$

formula $\ln(A^N) = N\ln(A)$

OR Round

$$2.9 = t$$

35

$x+y+2z=-3$

$x+y+3z=-4$

$x+3y+7z=-14$

use graphing calculator

2ND, matrix, edit [A], 3x4

$$[A]=\begin{bmatrix} 1 & 1 & 2 & -3 \\ 1 & 1 & 3 & -4 \\ 1 & 3 & 7 & -14 \end{bmatrix}$$

2ND, matrix, math, rref, enter

$$\text{rref}[A]=\begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & -3 \\ 0 & 0 & 1 & -1 \end{bmatrix}$$

$(x,y,z)=(2,-3,-1)$

36

$$\sum_{\text{start } i=1}^{\text{stop } 3} i(i+1)$$

$a_1 + a_2 + a_3 =$

formula

$$\text{Stop} \rightarrow \sum_{\text{Start} \rightarrow i=1}^{n} a_i = a_1 + a_2 + a_3 + \ldots a_n$$

start stop

36

$\underset{a_1}{(1(1+1))} + \underset{a_2}{(2(2+1))} + \underset{a_3}{(3(3+1))} =$

$(1(2)) + (2(3)) + (3(4)) =$

$(2) + (6) + (12) =$

$2 + 6 + 12 =$

$20 =$

OR use graphing calculator

Math, Summation, Σ

37. $(4x-1)^3$ expand

$${}_3C_0 (4x)^3(-1)^0 + {}_3C_1(4x)^2(-1)^1 + {}_3C_2 (4x)^1(-1)^2 + {}_3C_3(4x)^0(-1)^3$$

$$(1)(4^3x^3)(1) + (3)(4^2x^2)(-1) + (3)(4^1x^1)(1) + (1)(1)(-1) =$$

$$(1)(64x^3)(1) + (3)(16x^2)(-1) + (3)(4x)(1) + (1)(1)(-1) =$$

$$64x^3 - 48x^2 + 12x - 1 =$$

use graphing calculator

3, Math, Prb, nCr, enter,

3, nCr, 0 = 1

3, nCr, 1 = 3

3, nCr, 2 = 3

3, nCr, 3 = 1