M/3/4 TEST 3 Step

05 22 17

① $\sqrt{30x+15} = x+8$

$(\sqrt{30x+15})^2 = (x+8)^2$

$30x+15 = (x+8)(x+8)$

$30x+15 = x^2+8x+8x+64$

$30x+15 = x^2+16x+64$

$0 = x^2+16x+64-30x-15$

$0 = x^2-14x+49$

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

but $x-7=0$ OR $x-7=0$

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

$x=7$ OR $x=7$

Good

Ck

$\sqrt{30x+15} = x+8$

$\sqrt{30(7)+15} = (7)+8$

$\sqrt{210+15} = 7+8$

$\sqrt{225} = 15$

$15 = 15$

Good

$\{7\}$

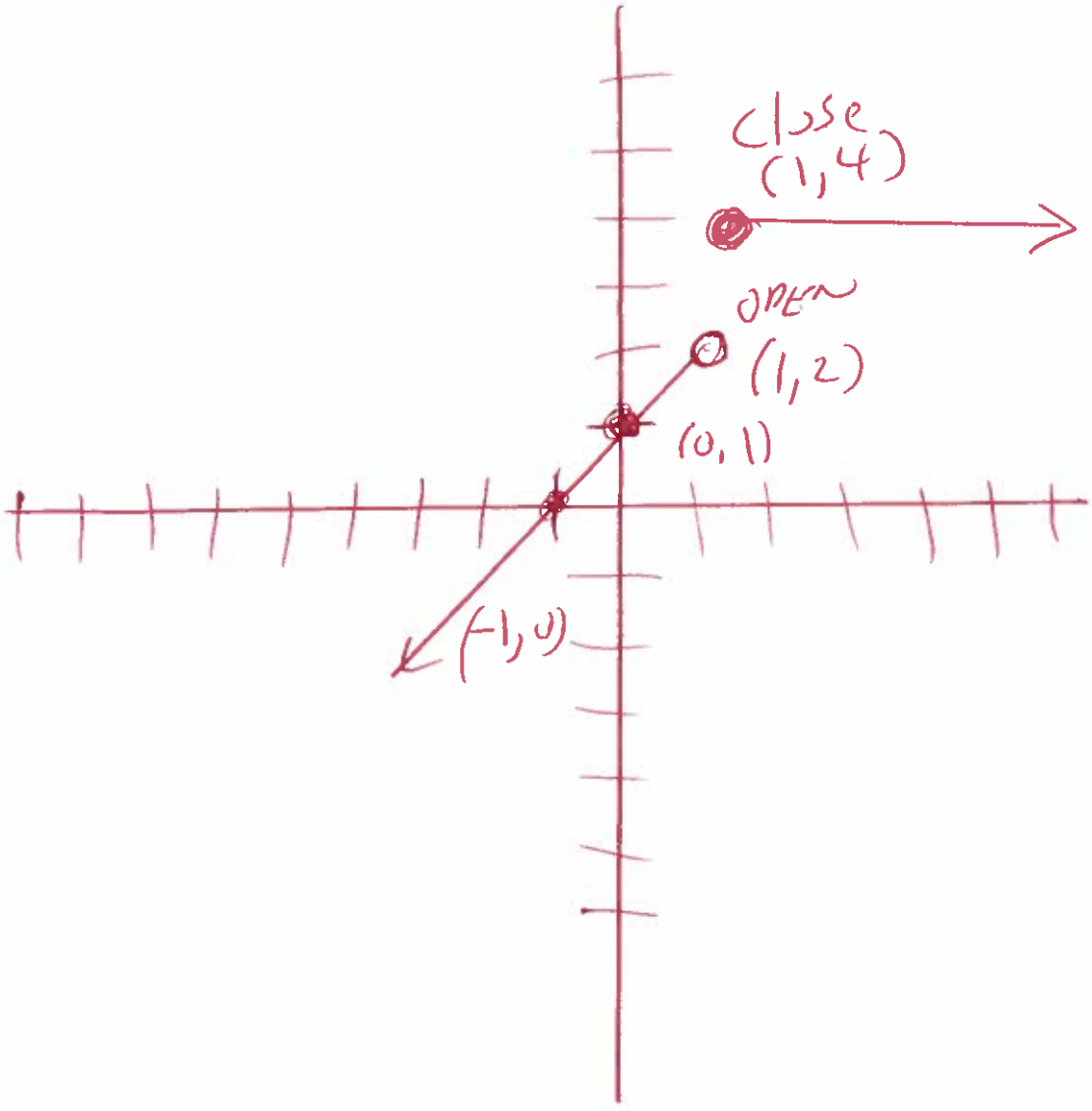
2. graph

$$f(x) = \begin{cases} x+1 & \text{if } x < 1 \\ 4 & \text{if } x \geq 1 \end{cases}$$

use graphing calculator

$Y_1 = X+1 \div (X<1)$ (2nd math) OPEN

$Y_2 = 4 \div (X \geq 1)$ (2nd math) close



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

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

$$\frac{((x+h)^2 + 5(x+h) + 6) - (x^2 + 5x + 6)}{h} =$$

$$\frac{(x+h)(x+h) + 5x + 5h + 6 - x^2 - 5x - 6}{h} =$$

$$\frac{x^2 + xh + xh + h^2 + 5x + 5h + 6 - x^2 - 5x - 6}{h} =$$

$$\frac{1xh + 1xh + h^2 + 5h}{h} =$$

$$\frac{2xh + h^2 + 5h}{h} =$$

$$2x + h + 5 =$$

(4) Graph

$h(x) = |x-3| - 3$

Use graphing calculator

Y_1 = Math Num abs

$Y_1 = abs(x - 3) - 3$

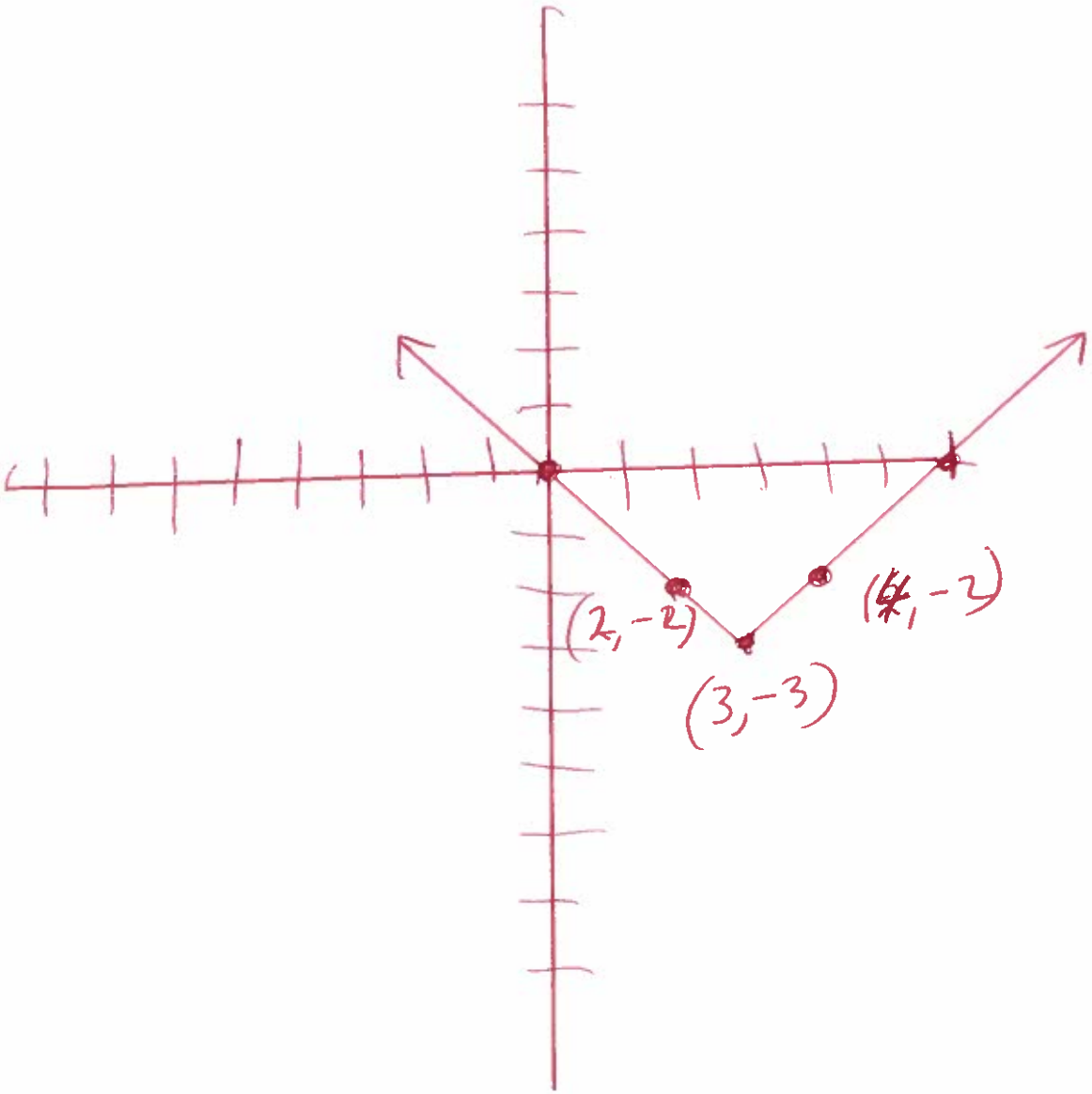
x	h x
2	-2
3	-3
4	-2

(4)

$h(2) = |2-3| - 3 = |-1| - 3 = 1 - 3 = -2$

$h(3) = |3-3| - 3 = |0| - 3 = 0 - 3 = -3$

$h(4) = |4-3| - 3 = |1| - 3 = 1 - 3 = -2$



(5) find domain

$f(x) = \sqrt{18 - x}$

domain formula (5.1)

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

set $Ax + B \geq 0$

set $18 - x \geq 0$

$18 - x - 18 \geq 0 - 18$

$-x \geq -18$

$\frac{-x}{-1} \leq \frac{-18}{-1}$

$x \leq 18$

18

$(-\infty, 18]$

(6) $f(x) = 4x^2 + 3x + 6$ and $g(x) = 3x - 4$ (6.)

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

$g(f(x)) =$

$g(4x^2 + 3x + 6) =$

$3(4x^2 + 3x + 6) - 4 =$

$12x^2 + 9x + 18 - 4 =$

$12x^2 + 9x + 14 =$

7) Find distance between the points.

(7)

$(-1, -3)$ and $(-7, 5)$

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

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

$$d = \sqrt{((-1) - (-7))^2 + ((-3) - (5))^2}$$

$$d = \sqrt{(-1+7)^2 + (-3-5)^2}$$

$$d = \sqrt{(6)^2 + (-8)^2}$$

$$d = \sqrt{36 + 64}$$

$$d = \sqrt{100}$$

$$d = 10$$

(8) Graph

$x^2+y^2-8x-4y+11=0$

complete the square (8)

$x^2-8x+y^2-4y=-11$ rewrite

$x^2-8x+\left(\frac{1}{2}(-8)\right)^2+y^2-4y+\left(\frac{1}{2}(-4)\right)^2=-11+\left(\frac{1}{2}(-8)\right)^2+\left(\frac{1}{2}(-4)\right)^2$

$x^2-8x+(-4)^2+y^2-4y+(-2)^2=-11+(-4)^2+(-2)^2$

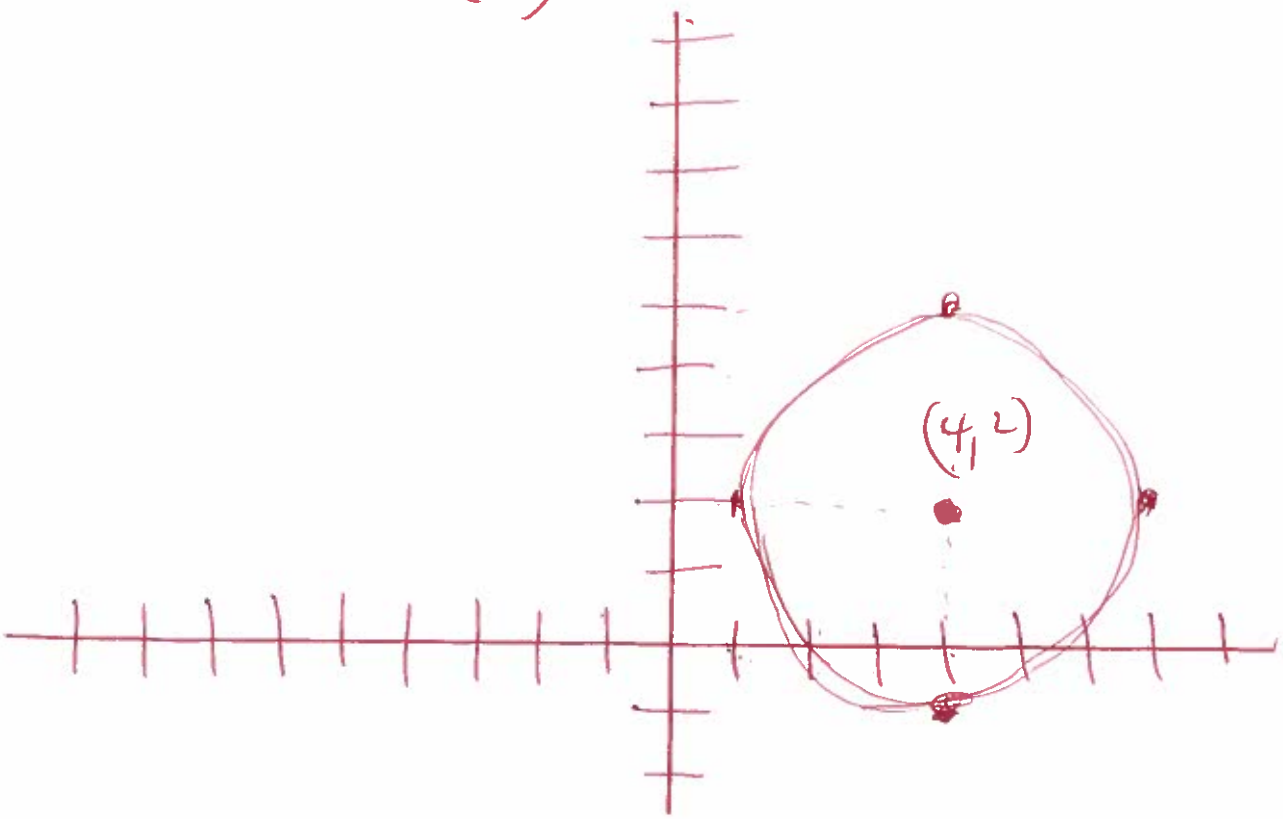
$x^2-8x+16+y^2-4y+4=-11+16+4$

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

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

OPP OPP

CENTER $=(4,2)$ Radius $=\sqrt{9}=3$



9. Find Max

$h(x) = -16x^2 + 160x$

$a = -16 \quad b = 160 \quad c = 0$

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

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

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

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

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

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

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

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

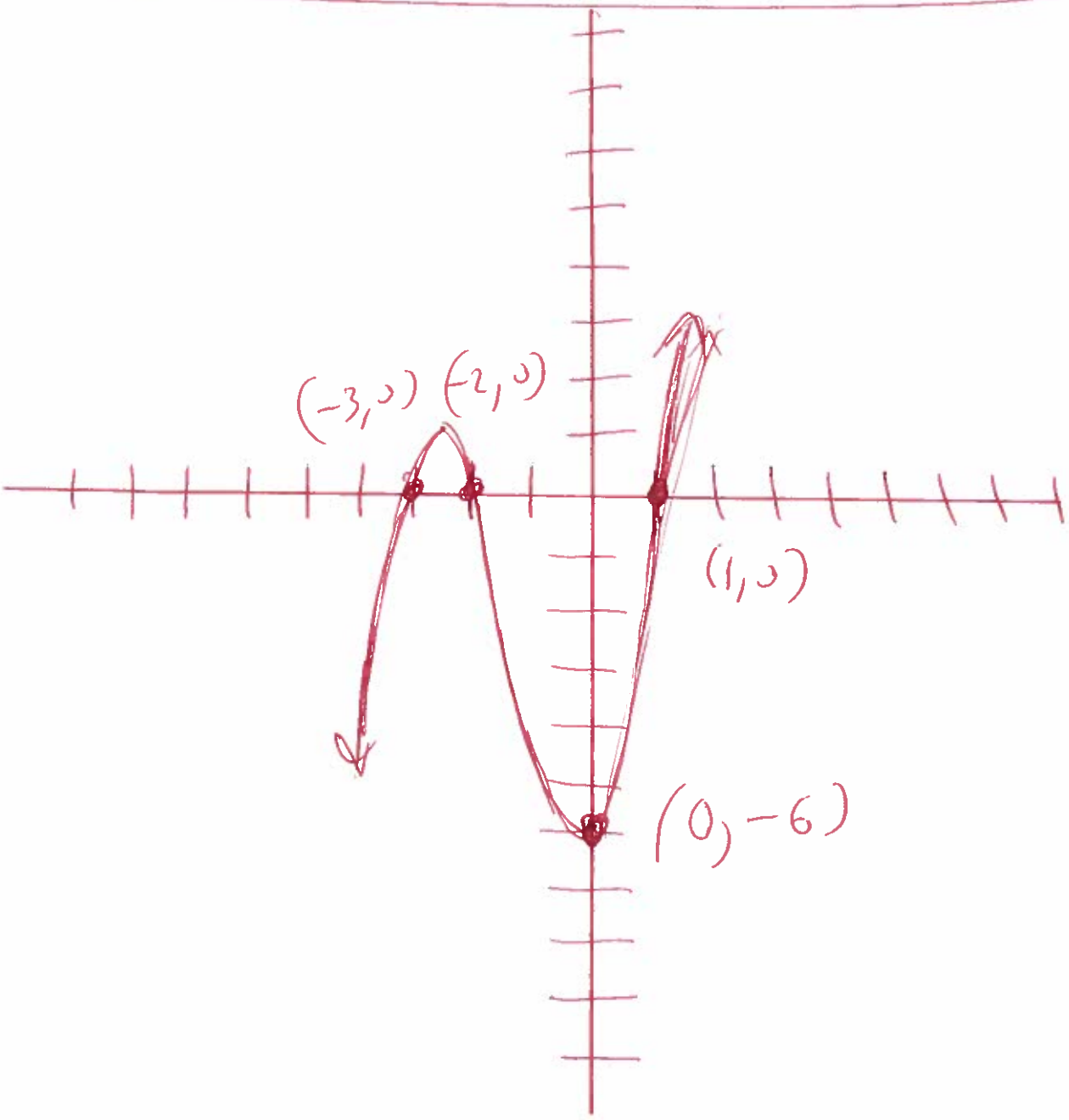
$\text{Max} = 400$

10. graph

$f(x) = x^3 + 4x^2 + x - 6$

use a graphing calculator

$y_1 = x\wedge 3 + 4x\wedge 2 + x - 6$



11. $1x^3+8x^2-18x+20=0$

$\pm 20, \pm 10, \pm 5, \pm 4, \pm 2, \pm 1$

Possible

use synthetic division

-10	1	8	-18	20
		-10	20	-20
	1	-2	2	0 Rem

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

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

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

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

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

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

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

$x=1\pm 1i$

$x=1-i$ or $x=1+i$

$\{-10,\ 1+i,\ 1-i\}$

(12) Find the vertical asymptotes

$$\frac{x-49}{x^2-7x+10}$$

(12)

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

$(x-2)(x-5)=0$

$x-2=0$ or $x-5=0$

$x-2+2=0+2$ OR $x-5+5=0+5$

$x=2$ or $x=5$

Vertical asymptotes

(13) find the slant asymptote

(13.)

$$f(x) = \frac{x^2 + 6x - 5}{x - 4}$$

use Synthetic division

4 | 1 6 −5

4 40

1 10 35

$y = x + 10$

Slant Asymptote

14. Find the domain

$f(x) = \ln(8 - x)$

14.

domain formula

$f(x) = \log_3(Ax + B)$

$Ax + B > 0$

$8 - x > 0$

$8 - x - 8 > 0 - 8$

$-x > -8$

$\frac{-x}{-1} < \frac{-8}{-1}$

$x < 8$

$(-\infty, 8)$

15. Expand

$$\log\left(\frac{4x^4\sqrt[3]{5-x}}{6(x+5)^2}\right) =$$

15

$$\log\left(4x^4\sqrt[3]{5-x}\right) - \log\left(6(x+5)^2\right) =$$

$$\left(\log(4)+\log(x^4)+\log\sqrt[3]{5-x}\right) - \left(\log(6)+\log(x+5)^2\right) =$$

$$\left(\log(4)+\log(x^4)+\log(5-x)^{1/3}\right) - \left(\log(6)+\log(x+5)^2\right) =$$

$$\log(4)+\log(x^4)+\log(5-x)^{1/3} - \log(6) - \log(x+5)^2 =$$

$$\log(4)+4\log(x)+\frac{1}{3}\log(5-x) - \log(6) - 2\log(x+5) =$$

Formulas

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

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

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

$$\ln(e)=1$$

16. Solve

$16^{x+7} = 64^{x-10}$

$(4^2)^{x+7} = (4^3)^{x-10}$

$4^{2x+14} = 4^{3x-30}$

$2x+14 = 3x-30$

$2x+14-14 = 3x-30-14$

$2x = 3x-44$

$2x-3x = 3x-44-3x$

$-1x = -44$

$\frac{-1x}{-1} = \frac{-44}{-1}$

$x = 44$

16

17.

Solve

$3^{x+6} = 8$

$\ln(3^{x+6}) = \ln(8)$

$(x+6)\ln(3) = \ln(8)$

$\frac{(x+6)\ln(3)}{\ln(3)} = \frac{\ln(8)}{\ln(3)}$

$x+6 = \frac{\ln(8)}{\ln(3)}$

$x+6-6 = \frac{\ln(8)}{\ln(3)} - 6$

$x = \frac{\ln(8)}{\ln(3)} - 6$

$x = -4.107210739$

OR Round

$x = -4.11$

17.

Formula:

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

(18) Solve

$$\log_4(x-1)+\log_4(x-7)=2$$

(18)

formulas

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

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

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

$\ln(e)=1$

$$\log_4((x-1)(x-7))=2$$

$$4^2=(x-1)(x-7)$$ Rewrite

$$16=x^2-7x-1x+7$$

$$16=x^2-8x+7$$

$$0=x^2-8x+7-16$$

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

$$0=(x+1)(x-9)$$

Let $x+1=0$ or $x-9=0$

$x+1-1=0-1$ OR $x-9+9=0+9$

$x=-1$ BAD OR $x=9$ Good

Ck $\log_4(-1-1)+\log_4(-1-7)=2$

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

BAD BAD

Ck $\log_4(9-1)+\log_4(9-7)=2$

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

Good Good

$\{9\}$

19. Solve

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

$$\log\left(\frac{4+x}{x-4}\right) = \log(3)$$

$$\frac{4+x}{x-4} = 3$$

$$\frac{4+x}{x-4} = \frac{3}{1}$$

$1(4+x) = 3(x-4)$ Cross Multiply

$4+1x = 3x-12$

$4+1x-4 = 3x-12-4$

$1x = 3x-16$

$1x-3x = 3x-16-3x$

$-2x = -16$

$\frac{-2x}{-2} = \frac{-16}{-2}$

$x = 8$

Formulas

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

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

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

$\ln(e) = 1$

{8}

Check

$\log(4+8) - \log(8-4) = \log(3)$

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

Good Good Good

(20) Solve

$\ln(x) + \ln(x-1) = \ln(72)$

$\ln(x)(x-1) = \ln(72)$

$x(x-1) = 72$

$x^2 - x = 72$

$x^2 - x - 72 = 0$

$(x+8)(x-9) = 0$

so $x+8=0$ or $x-9=0$

$x+8-8=0-8$ or $x-9+9=0+9$

$x = -8$ or $x = 9$

BAD Good

Ck $\ln(-8) + \ln(-8-1) = \ln(72)$

$\ln(-8) + \ln(-9) = \ln(72)$

BAD BAD

Ck $\ln(9) + \ln(9-1) = \ln(72)$

$\ln(9) + \ln(8) = \ln(72)$

Good Good Good

{9}

(20.)

Formulas

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

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

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

$\ln(e) = 1$

21

$$6200 = 3100\left(1+\frac{.08}{2}\right)^{2x}$$

$$\frac{6200}{3100} = \frac{3100\left(1+\frac{.08}{2}\right)^{2x}}{3100}$$

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

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

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

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

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

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

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

$$8.836493843 = x$$

OR Round

$$8.8 = x$$

21

formulas

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

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

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

$\ln(e) = 1$

(21) $200 = 100e^{.021x}$

double

$\frac{200}{100} = \frac{100e^{.021x}}{100}$

$2 = e^{.021x}$

$\ln(2) = \ln(e^{.021x})$

$\ln(2) = .021x \ln(e)$

$\ln(2) = .021x(1)$

$\frac{\ln(2)}{.021} = \frac{.021x}{.021}$

$33.00700986 = x$

OR Round

$33 = x$

(22.)

formulas

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

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

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

$\ln(e) = 1$

(23) Solve

$x+y+z=2$

$x-y+2z=-1$

$2x+y+z=1$

(23)

use graphing calculator

2ND Matrix Edit [A] 3 x 4

$$[A]=\begin{bmatrix}1 & 1 & 1 & 2\\ 1 & -1 & 2 & -1\\ 2 & 1 & 1 & 1\end{bmatrix}$$

2ND Matrix Math

rref

2ND Matrix

rref([A]) =

$$\begin{bmatrix}1 & 0 & 0 & -1\\ 0 & 1 & 0 & 2\\ 0 & 0 & 1 & 1\end{bmatrix}$$

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

24. $\sum_{\text{start}}^{5} (x^2+6)$

start → $x=3$

24.

$((3)^2+6)+((4)^2+6)+((5)^2+6)=$

$(9+6)+(16+6)+(25+6)=$

$15 + 22 + 31=$

$68=$

OR

Use graphy Calculate

Math

Summation Σ

$\square$

Σ $\square$

$\square = \square$

68

(25) Find 1st three terms (25.)

$(x+2)^{16} =$

$C_{16\,0}(x)(2)^{0} + C_{16\,1}(x)^{15}(2)^{1} + C_{16\,2}(x)^{14}(2)^{2} =$

$(1)(x^{16})(1) + (16)(x^{15})(2) + (120)(x^{14})(4) =$

$x^{16} + 32x^{15} + 480x^{14} =$

use Graphing Calculator

16 Math Prb nCr 0 = 1

16 Math Prb nCr 1 = 16

16 Math Prb nCr 2 = 120