M134 TEST 4 Step

052217

1

1

Solve by factoring

$15x^2+26x+8=0$

$(3x+4)(5x+2)=0$

Ans $3x+4=0$ or $5x+2=0$

$3x+4-4=0-4$ or $5x+2-2=0-2$

$3x=-4$ or $5x=-2$

$\frac{3x}{3}=\frac{-4}{3}$ or $\frac{5x}{5}=\frac{-2}{5}$

$x=-4/3$ or $x=-2/5$

Solve by the Quadratic formula

$15x^2+26x+8=0$

$a=15,\ b=26,\ c=8$

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

$$x=\frac{-(26)\pm\sqrt{(26)^2-4(15)(8)}}{2(15)}$$

$$x=\frac{-26\pm\sqrt{676-480}}{30}$$

$$x=\frac{-26\pm\sqrt{196}}{30}$$

$$x=\frac{-26\pm 14}{30}$$

$x=\frac{-26-14}{30}$ or $x=\frac{-26+14}{30}$

$x=\frac{-40}{30}$ or $x=\frac{-12}{30}$

$x=\frac{10(-4)}{10(3)}$ or $x=\frac{\cancel{6}(-2)}{\cancel{6}(5)}$

$x=-4/3$ or $x=-2/5$

(2) Solve by using the Quadratic formula

$1x^2+14x+58=0$ (2.)

$a=1,\ b=14,\ c=58$

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

$$x=\frac{-(14)\pm\sqrt{(14)^2-4(1)(58)}}{2(1)}$$

$$x=\frac{-14\pm\sqrt{196-232}}{2}$$

$$x=\frac{-14\pm\sqrt{-36}}{2}$$

$$x=\frac{-14\pm 6i}{2}$$

$$x=-7\pm 3i$$

$x=-7-3i$ OR $x=-7+3i$

3

Soln

3.

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

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

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

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

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

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

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

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

Let $x-7=0$ OR $x-7=0$

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

$x=7$ Good OR $x=7$

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

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

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

$\sqrt{225} = 15$

$15 = 15$ Good

$\{7\}$

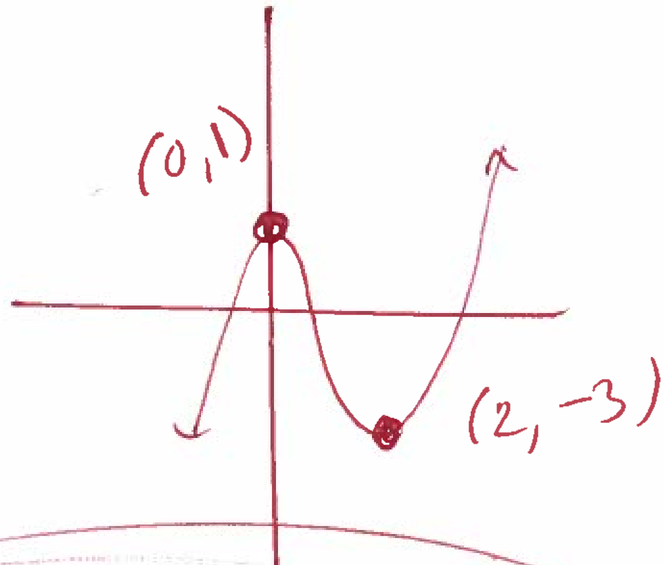
4. Find the relative maxima and minima.

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

(4)

use a graphing calculator

$y_1 = x^3 - 3x^2 + 1$



maximum (0,1)

minimum (2,-3)

5. graph

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

51

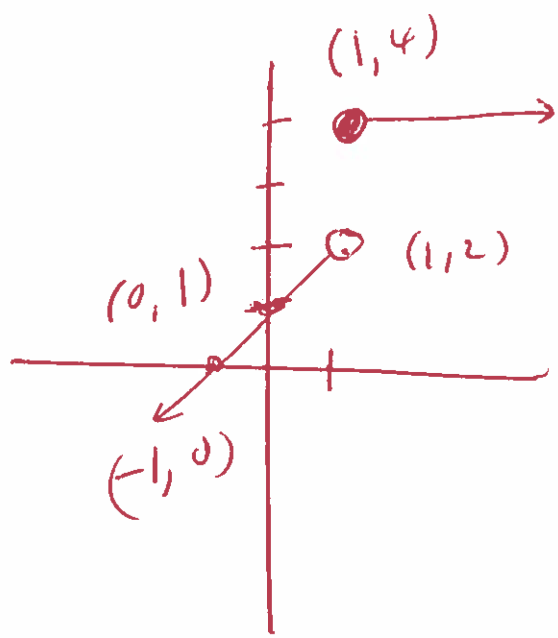
use a graphing calculator

2ND math

$y_1 = x+1 \div (x<1)$ OPEN

2ND math

$y_2 = 4 \div (x \geq 1)$ Close



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

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

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

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

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

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

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

$$2x + h + 5 =$$

7. graph

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

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

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

$h(2) = 1 - 3$

$h(2) = -2$

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

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

$h(3) = 0 - 3$

$h(3) = -3$

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

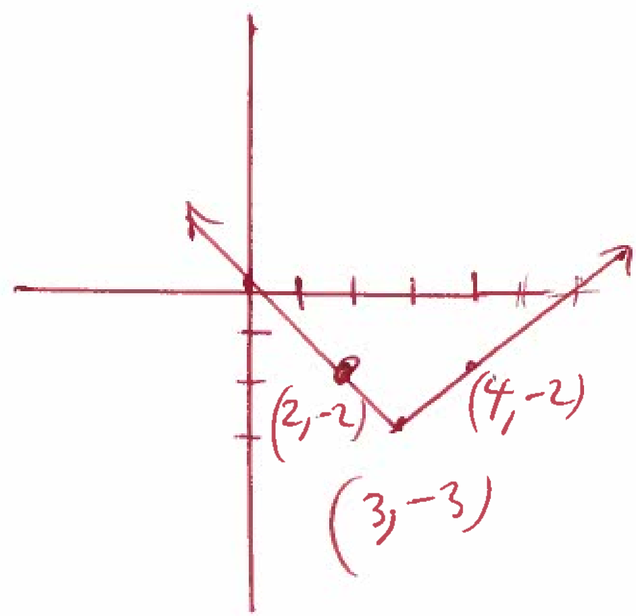
$h(4) = |1| - 3$

$h(4) = 1 - 3$

$h(4) = -2$

x	$h(x)$
2	-2
3	-3
4	-2

1.



Domain formula 8

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

set $Ax+B \geq 0$

8 Find the domain

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

set $18 - x \geq 0$

$$\cancel{18} - x - \cancel{18} \geq 0 - 18$$

$$-x \geq -18$$

$$\frac{-x}{-1} \leq \frac{-18}{-1}$$ Turn the alligator around

$$x \leq 18$$

$$(-\infty, 18]$$

9. $f(x) = 2x - 6$ and $g(x) = 9x - 8$ 9

Find $f - g$

$(f-g)(x) =$

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

$(2x-6) - (9x-8) =$

$2x - 6 - 9x + 8 =$

$-7x + 2 =$

(10) $f(x) = 3x + 2$ and $g(x) = 2x + 8$ 10.

Find $fg =$

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

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

$(3x+2)(2x+8) =$

$6x^2 + 24x + 4x + 16 =$

$6x^2 + 28x + 16 =$

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

replace here

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

$g(f(x)) =$

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

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

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

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

11

(12) Find the distance

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

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

(12)

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

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

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

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

$d = \sqrt{36 + 64}$

$d = \sqrt{100}$

$d = 10$

13 Graph

13

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

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

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

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

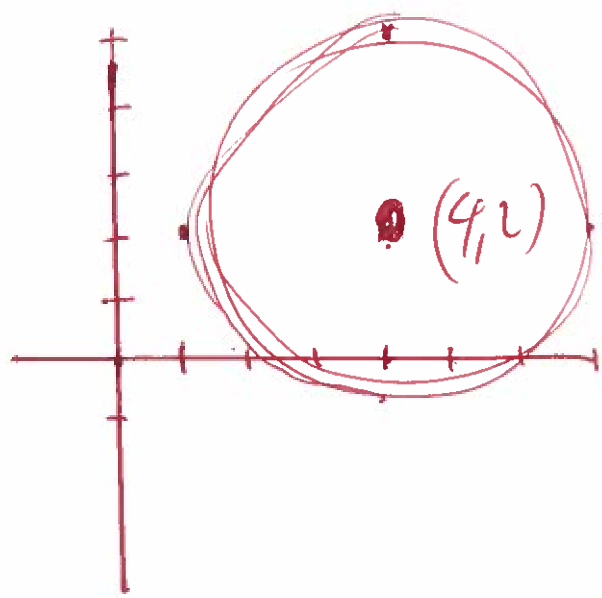
$\underbrace{x^2-8x+16}+y^2-4y+4=-11+16+4$

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

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

opposite   opposite

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



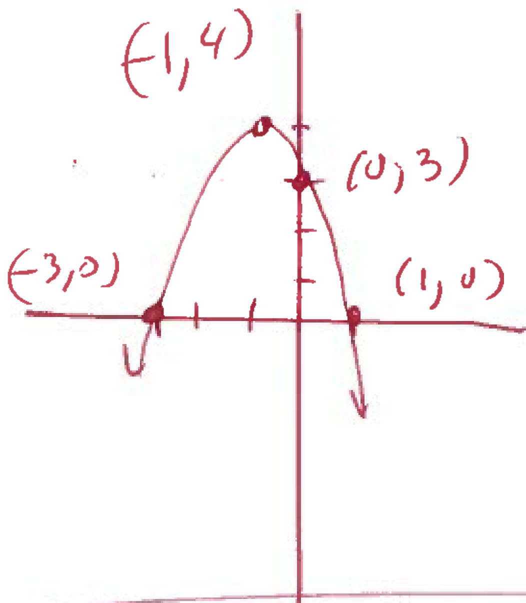
14. graph

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

14.

use a graphing calculator.

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



x interupts (-3,0) (1,0)

y intercept (0,3)

axis $x = -1$

vertex = (-1, 4)

15. Find the max

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

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

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

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

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

$Vertex = (5, f(5))$

$Vertex = (5, -16(5)^2 + 160(5))$

$Vertex = (5, -16(5)(5) + 160(5))$

$Vertex = (5, -16(25) + 160(5))$

$Vertex = (5, -400 + 800)$

$Vertex = (5, 400)$

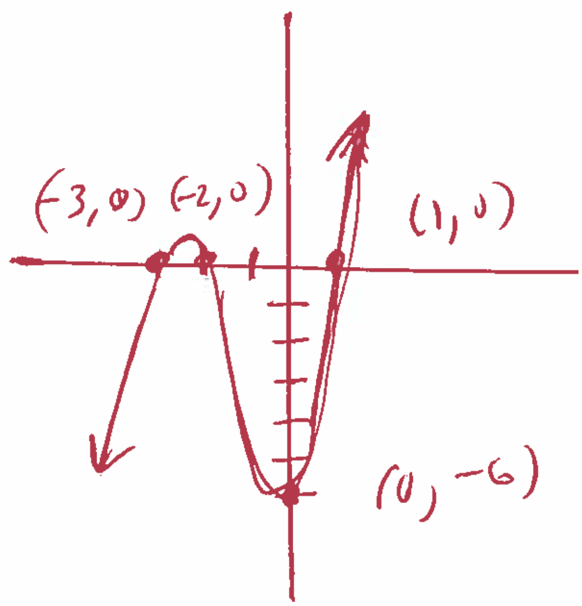
15

16. graph

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

use graphing calculator

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



16.

17 Solve

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

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

n.

use synthetic division

$$\begin{array}{r|rrrr} -10 & 1 & 8 & -18 & 20 \\ & & -10 & 20 & -20 \\ \hline & 1 & -2 & 2 & 0 \end{array}$$ rem

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

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

use Quadratic formula

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

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

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

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

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

$x=1\pm 1i$

$x=1\pm i$

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

(18) Find the vertical asymptotes

(18.)

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

10 · 1
2 · 5
possible

set $X^2-7X+10=0$

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

$X-2=0$ or $X-5=0$

$X-2+2=0+2$ OR $X\cancel{-5}\cancel{+5}=0+5$

$X=2$ or $X=5$

19 Find the slant asymptote (41)

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

use synthetic division

$$\begin{array}{r|rrr} 4 & 1 & 6 & -5 \\ & & 4 & 40 \\ \hline & 1 & 10 & 35 \end{array}$$

35 Rem

$y = x + 10$

20 Find the domain

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

set $8 - x > 0$

$\cancel{8} - x - \cancel{8} > 0 - 8$

$-x > -8$

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

$x < 8$

$(-\infty, 8)$

domain formula

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

set $Ax + B > 0$

21. Expand

21.

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

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

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

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

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

Formulas

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

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

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

22

Soln

22

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

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

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

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

$$2x+\cancel{14}-\cancel{14} = 3x-30-14$$

$$2x = 3x-44$$

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

$$-1x = -44$$

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

$$x = 44$$

23

23

Solve

$$3^{x+6} = 8$$

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

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

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

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

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

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

$$x = -4.11$$

24

Solve

24

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

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

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

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

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

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

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

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

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

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

$\cancel{x=-1}$ OR $x=9$ ✓

BAD Good

Ck

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

$\log_4(\cancel{-2})+\log_4(\cancel{-8})=2$

BAD BAD

Ck

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

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

Good Good

$\{9\}$

25.

Solve

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

$\log_4 \left(\frac{x+2}{x}\right) = 2$

$4^2 = \frac{x+2}{x}$

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

$\frac{16}{1} = \frac{x+2}{x}$

$16(x) = 1(x+2)$ cross mult

$16x = 1x + 2$

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

$15x = 2$

$\frac{\cancel{15}x}{\cancel{15}} = \frac{2}{15}$

$x = \frac{2}{15}$

$\left\{\frac{2}{15}\right\}$

$\log_4 \left(\frac{2}{15} + 2\right) - \log_4 \left(\frac{2}{15}\right) = 2$

Good positive

Good Positive

25.

(26)

Solve

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

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

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

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

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

$4+1x = 3x-12$

$\cancel{4}+1x-\cancel{4} = 3x-12-4$

$1x = 3x-16$

$1x-3x = \cancel{3x}-16-\cancel{3x}$

$-2x = -16$

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

$x = 8$

$\{8\}$

ck

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

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

Good positive Good positive Good positive

(26)

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

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

(27)

$x(x-1) = 72$

$x^2 - x = 72$

$x^2 - x - 72 = 0$

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

let $x+8=0$ OR $x-9=0$

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

$\cancel{x=-8}$ OR $x=9$

Good

$\{9\}$

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

(28) Soln

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

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

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

$$2 = (1+.04)^{2t}$$

$$2 = (1.04)^{2t}$$

$$\ln(2) = \ln(1.04)^{2t}$$

$$\ln(2) = 2t\ln(1.04)$$

$$\frac{\ln(2)}{\ln(1.04)} = \frac{2t\cancel{\ln(1.04)}}{\cancel{\ln(1.04)}}$$

$$\frac{\ln(2)}{\ln(1.04)} = 2t$$

$$\frac{1}{2}\,\frac{\ln(2)}{\ln(1.04)} = \cancel{\frac{1}{2}}(\cancel{2}t)$$

$$\frac{\ln(2)}{(2\ln(1.04))} = t$$

$$8.8364938426 = t$$

OR

$$8.8 = t \text{ Round}$$

29 Solve 29

$$159 = 900e^{-0.00866x}$$

$$\frac{159}{900} = \frac{\cancel{900}e^{-0.00866x}}{\cancel{900}}$$

$$\frac{159}{900} = e^{-0.00866x}$$

$$\ln\left(\frac{159}{900}\right) = \ln\left(e^{-0.00866x}\right)$$

$$\ln\left(\frac{159}{900}\right) = -0.00866x\,\ln(e)$$

$$\ln\left(\frac{159}{900}\right) = -0.00866x(1)$$

$$\ln\left(\frac{159}{900}\right) = -0.00866x$$

$$\frac{\ln\left(\frac{159}{900}\right)}{-0.00866} = \frac{\cancel{-0.00866}x}{\cancel{-0.00866}}$$

$$200.17212022 = x$$

OR Round

$$200 = x$$

(3)

(30)

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

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

$$2 = e^{.021x}$$

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

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

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

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

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

$$33.00700598 = x$$

~~Or Round~~

$$33 = x$$

31

Solve

Use a graphing calculator

31

$$x + y + z = 2$$
$$x - y + 2z = -1$$
$$2x + y + z = 1$$

2ND matrix Edit [A] 3X4

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

2ND matrix math rref

$$\text{rref}([A]) =$$

$$\begin{array}{cc} \begin{bmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 1 \end{bmatrix} & \begin{matrix} x \\ y \\ z \end{matrix} \end{array}$$

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

32. $\sum_{x=3}^{5} (x^2+6)$

32.

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

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

$15 + 22 + 31 =$

$68 =$

or use graphing calculator

math summation Σ

$\sum_{\square=\square}^{\square} \square =$

$\sum_{x=3}^{5} (x^2+6) =$ enter

$68 =$

33 Find the 1st three terms

33

$(x+2)^{16}$

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

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

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

Use graphing calculator