① $\frac{x}{5} = \frac{x}{6} + \frac{2}{5}$ Solve MO360 high school 835 HCA

011919

$\frac{x}{5}(30) = \frac{x}{6}(30) + \frac{2}{5}(30)$ Mult by LCD

$x(6) = x(5) + 2(6)$

$6x = 5x + 12$

$6x - 5x = 5x + 12 - 5x$

$1x = 12$

$x = 12$

Solve

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② $1.1x + 4.3 = 0.7x + 1.14$

$1.1x + 4.3 - 4.3 = 0.7x + 1.14 - 4.3$

$1.1x = 0.7x - 3.16$

$1.1x - 0.7x = 0.7x - 3.16 - 0.7x$

$.4x = -3.16$

$\frac{.4x}{.4} = \frac{-3.16}{.4}$

$x = -7.9$

(3) $8(3x-0.2) = 7x - 1.6$ Solve

$24x - 1.6 = 7x - 1.6$

$24x - 1.6 + 1.6 = 7x - 1.6 + 1.6$

$24x = 7x$

$24x - 7x = 7x - 7x$

$17x = 0$

$\frac{17x}{17} = \frac{0}{17}$

$x = 0$

(4) \$18,000 at 5% compounded annually for 5 years

$A = P(1 + \frac{r}{N})^{N \cdot t}$

$P = 18000$

$r = .05$

$t = 5$

$N = 1$

$A = \$18000(1 + \frac{.05}{1})^{(1)(5)}$

$A = \$18000(1 + .05)^5$

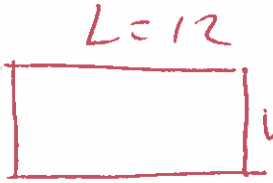
$A = \$18000(1.05)^5$

$A = 18000(1.276281563)$

$A = 22973.068813$

$= 22973.07$ round

(5)



Find W

Perimeter = 46

$P = 2L + 2W$

$46 = 2(12) + 2(x)$

$46 = 24 + 2x$

$46 - 24 = 24 + 2x - 24$

$22 = 2x$

$\frac{22}{2} = \frac{2x}{2}$

$11 = x$ width

⑥ $A = P + PRT$ Solve for T

$A - P = P + PRT - P$

$A - P = PRT$

$\frac{A-P}{PR} = \frac{PRT}{PR}$

$\frac{A-P}{PR} = T$

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⑦ $-16x - 32 \leq -4(3x+3)$

$-16x - 32 \leq -12x - 12$

$-16x - 32 + 32 \leq -12x - 12 + 32$

$-16x \leq -12x + 20$

$-16x + 12x \leq -12x + 20 + 12x$

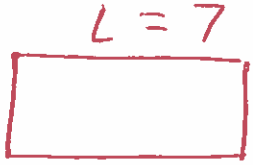
$-4x \leq 20$

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

$x \geq -5$

$[-5, \infty)$

(8.) The area of a rectangle must be at least 84 square feet. If the length is 7 feet, find the minimum for the rectangles width.



area = 84

$A = L \cdot W$

$84 = (7)(x)$

$84 = 7x$

$\frac{84}{7} = \frac{7x}{7}$

$12 = x$ minimum

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

$y = -2(0) + 4$

$y = 0 + 4$

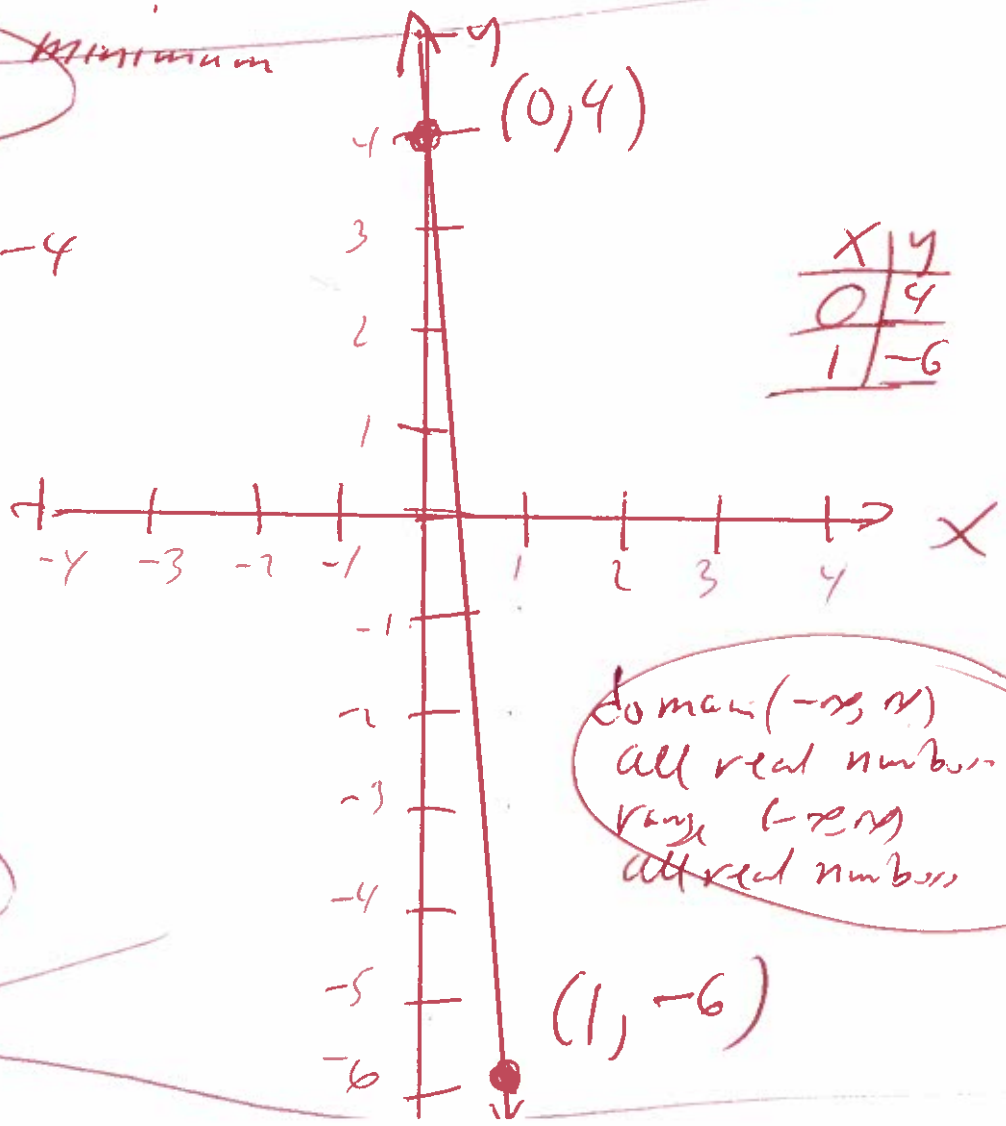
$y = 4$

$y = -2(1) - 4$

$y = -2 - 4$

$y = -6$

x	y
0	4
1	-6



domain $(-\infty, \infty)$
all real numbers
range $(-\infty, \infty)$
all real numbers

(10.) $5y - 25x = 10$

$5y - 25x + 25x = 10 + 25x$

$5y = 10 + 25x$

$\frac{5y}{5} = \frac{10}{5} + \frac{25x}{5}$

$y = 2 + 5x$

$y = 5x + 2$

x	y
0	2
1	7

$y = 5(0) + 2$

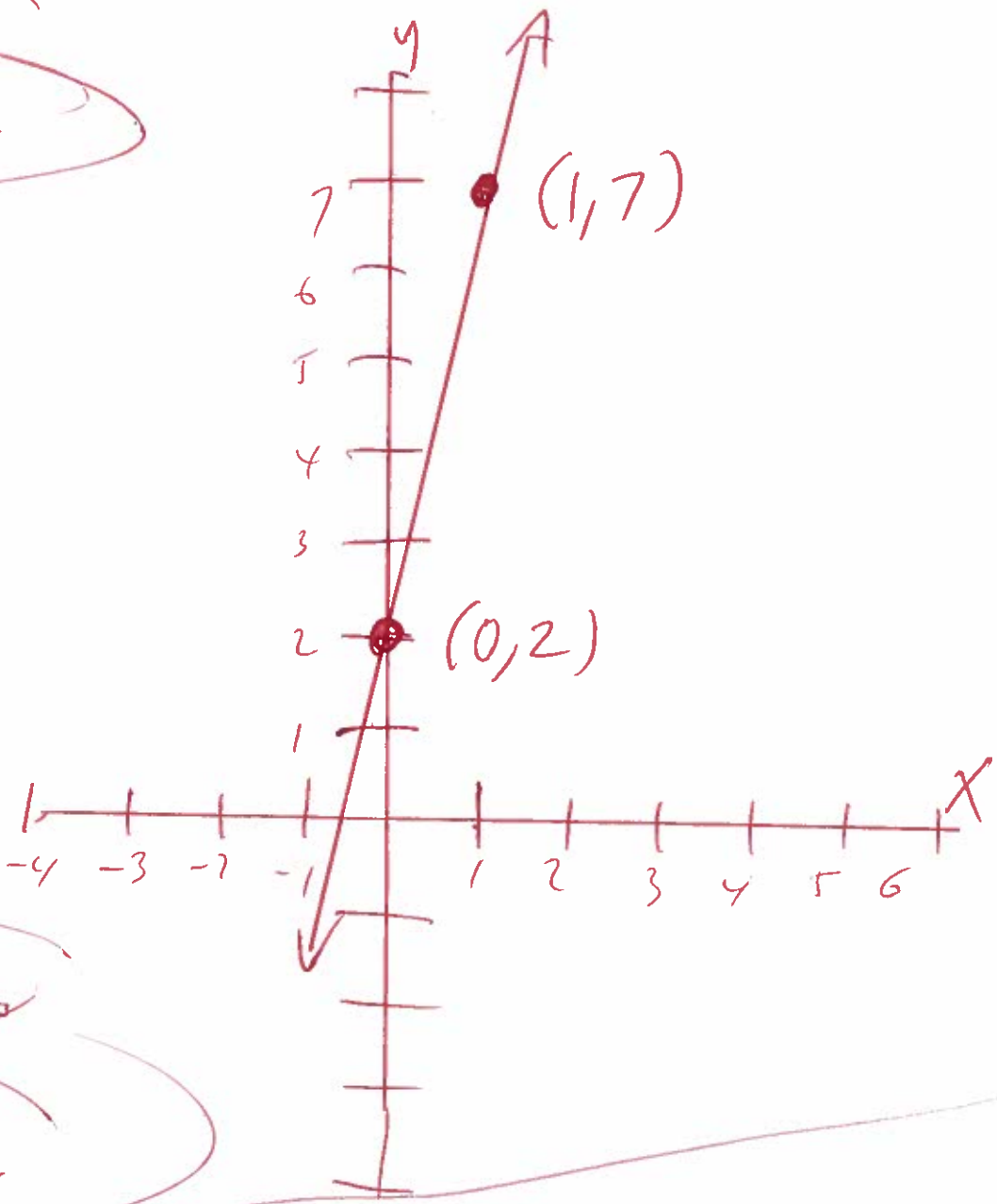
$y = 0 + 2$

$y = 2$

$y = 5(1) + 2$

$y = 5 + 2$

$y = 7$

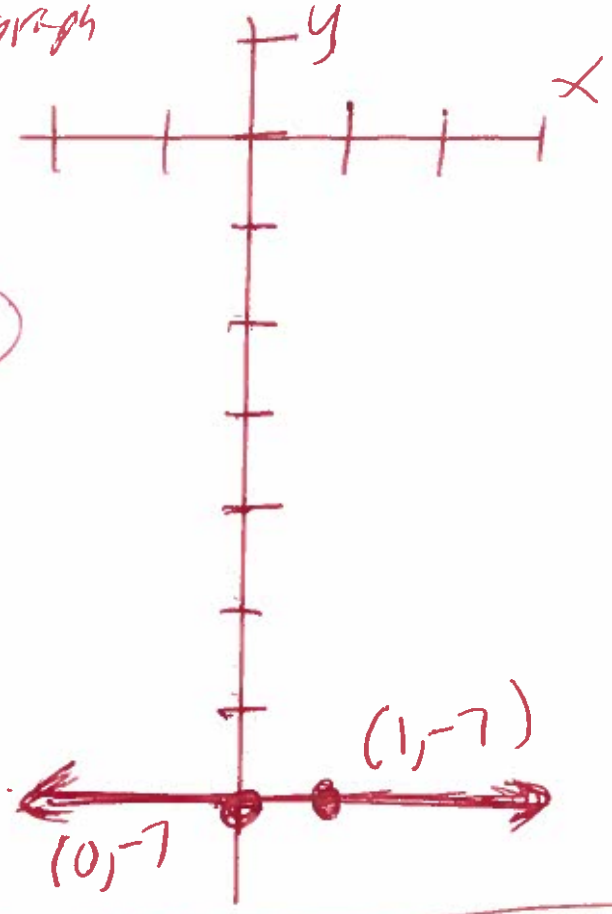


domain $(-\infty, \infty)$
all real number

range $(-\infty, \infty)$
all real number

graph

11. $y = -7$



x	y
0	-7
1	-7

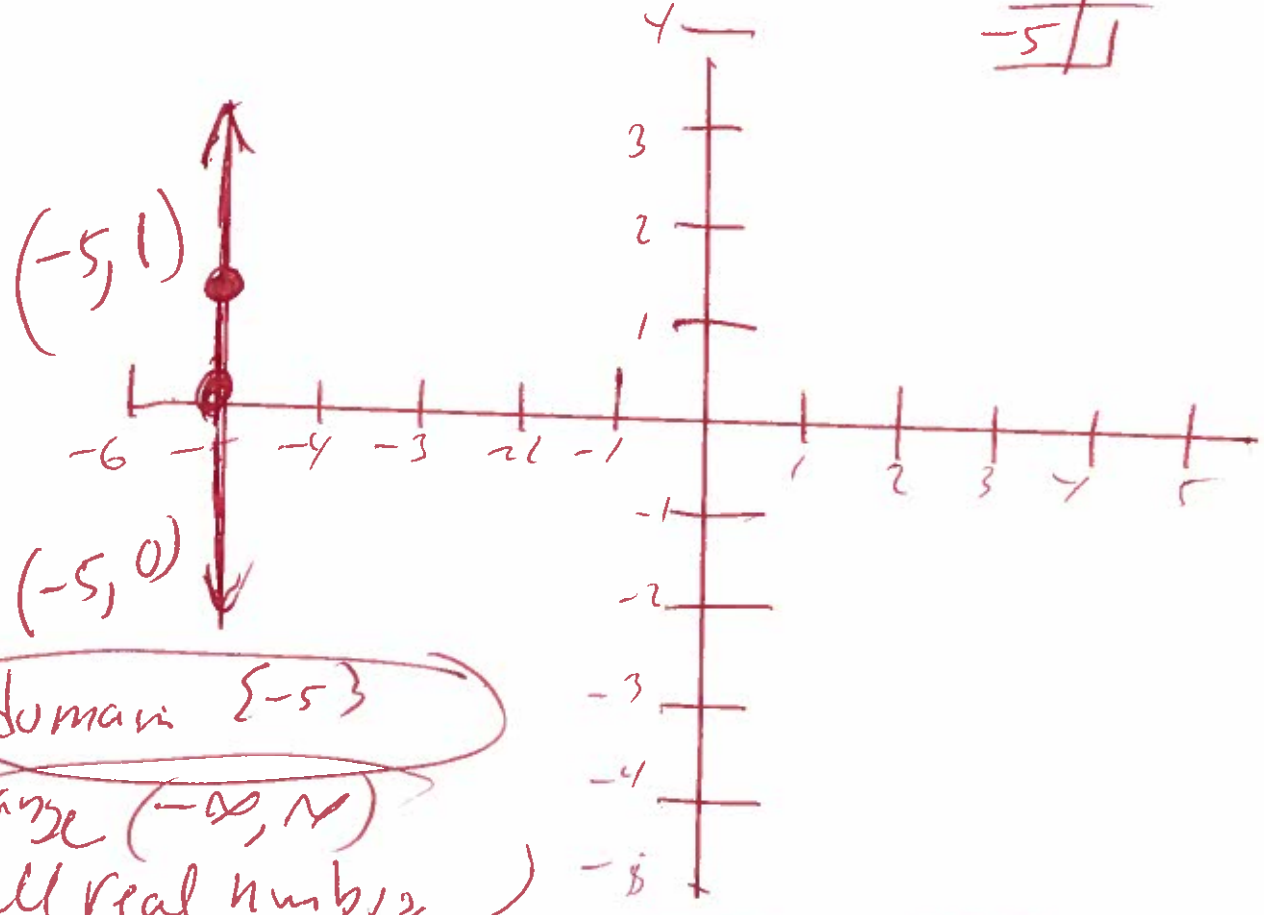
domain $(-\infty, \infty)$
all real numbers

range $\{-7\}$

graph

12. $x = -5$

x	y
-5	0
-5	1



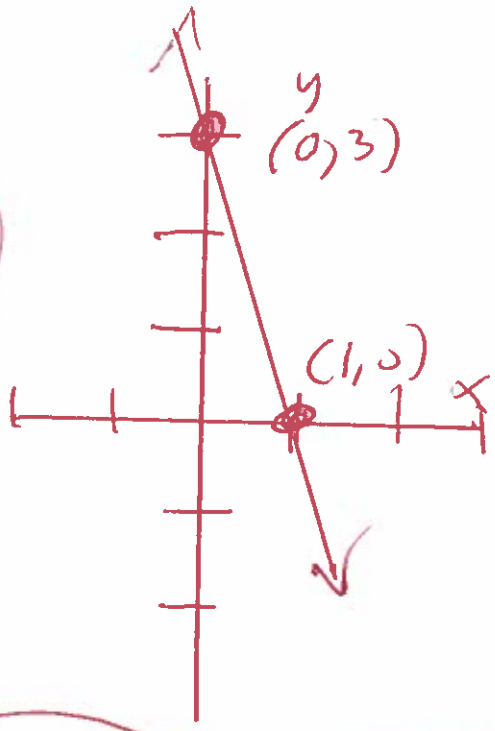
domain $\{-5\}$

range $(-\infty, \infty)$
all real numbers

(13.) Identify the intercepts

x-intercept = 1 OR (1, 0)

y-intercept = 3 OR (0, 3)



(14.) Find the slope of the line that passes through the given points.

$(-6, 9)$ and $(-1, 6)$

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

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

$$m = \frac{(9)-(6)}{(-6)-(-1)}$$

$$m = \frac{9-6}{-6+1}$$

$$m = \frac{3}{-5}$$

OR

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

(15.) Find the slope of the line

$8x - 5y = 40$

$8x - 5y - 8x = 40 - 8x$

$-5y = 40 - 8x$

$\frac{-5y}{-5} = \frac{40}{-5} - \frac{8x}{-5}$

$y = -8 + \frac{8}{5}x$

$y = \frac{8}{5}x - 8$

formula

$y = mx + b$

slope-intercept

slope $= \frac{8}{5} = m$

y-intercept $= -8$ OR $(0, -8)$

(16.) determine whether the pair of lines is parallel, perpendicular, or neither.

$y = \frac{5}{2}x + 2$ $\quad m_1 = \frac{5}{2}$

$y = -\frac{2}{5}x + 5$ $\quad m_2 = -\frac{2}{5}$

$m_1 \cdot m_2 = \left(\frac{5}{2}\right)\left(\frac{-2}{5}\right) = \frac{-10}{10} = -1$

perpendicular

(17)

(7000, 2722.2) and (3000, 1166.7)
x_1 y_1 x_2 y_2

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

$$m = \frac{(2722.2) - (1166.7)}{(7000) - (3000)}$$

$$m = \frac{2722.2 - 1166.7}{7000 - 3000}$$

$$m = \frac{1555.5}{4000}$$

$m = .388875$

OR

$= \#0.39$ round

(18) Find the equation of the line
slope = 2 = m and point (5, 2)
x_1 y_1

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

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

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

$y - 2 = 2x - 10$

$y - 2 + 2 = 2x - 10 + 2$

$y = 2x - 8$

(19) Find the equation of the line through the points (−6, 3) and (0, −2)
x_1 y_1 x_2 y_2

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

$y - (3) = \frac{(3) - (-2)}{(-6) - (0)}(x - (-6))$

$y - 3 = \frac{3 + 2}{-6 - 0}(x + 6)$

$y - 3 = \frac{5}{-6}(x + 6)$

$y - 3 = -\frac{5}{6}x - \frac{30}{6}$

$y - 3 = -\frac{5}{6}x - 5$

$y - 3 + 3 = -\frac{5}{6}x - 5 + 3$

$y = -\frac{5}{6}x + 2$

OR

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

$6y = -5x + 12$

$6y + 5x = -5x + 12 + 5x$

$6y + 5x = 12$

$-1(6y + 5x) = -1(12)$

$-6y - 5x = 12$

$-5x - 6y = 12$

(20.) $f(x) = x^2 + 4x - 3$ find $f(4)$

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

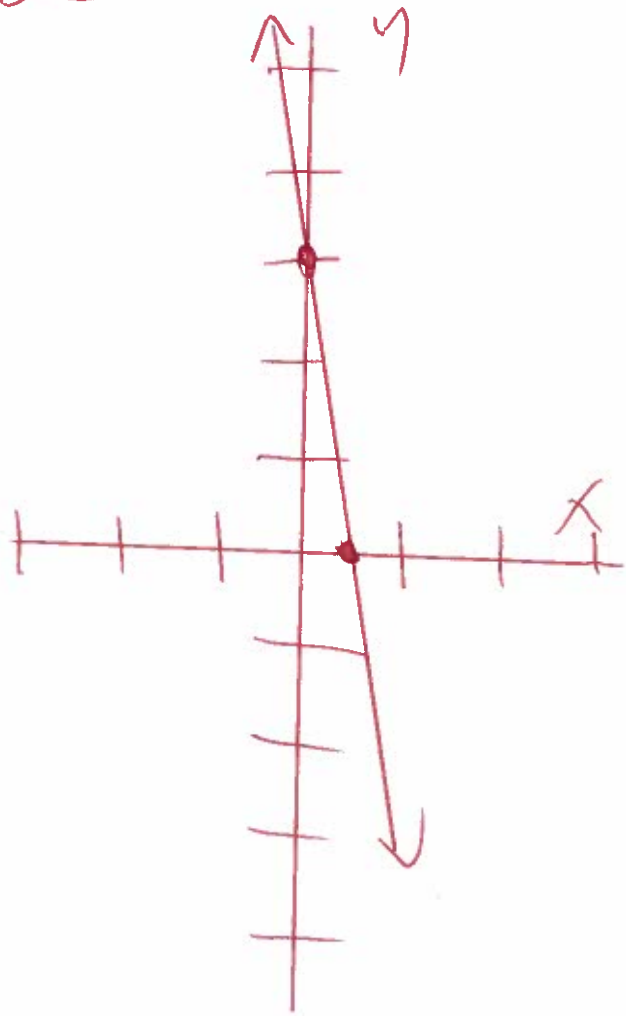
$f(4) = (4)(4) + 4(4) - 3$

$f(4) = 16 + 16 - 3$

$f(4) = 32 - 3$

$f(4) = 29$

(21.) find domain and range



left right

domain $(-\infty, \infty)$

or

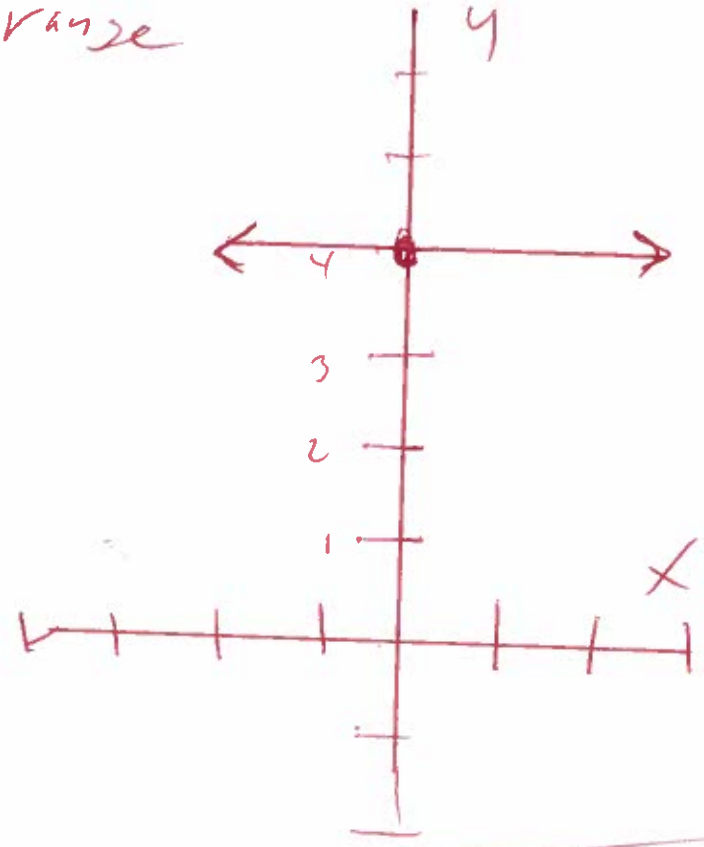
all real numbers

~~bottom~~ top

range $(-\infty, \infty)$

all real numbers

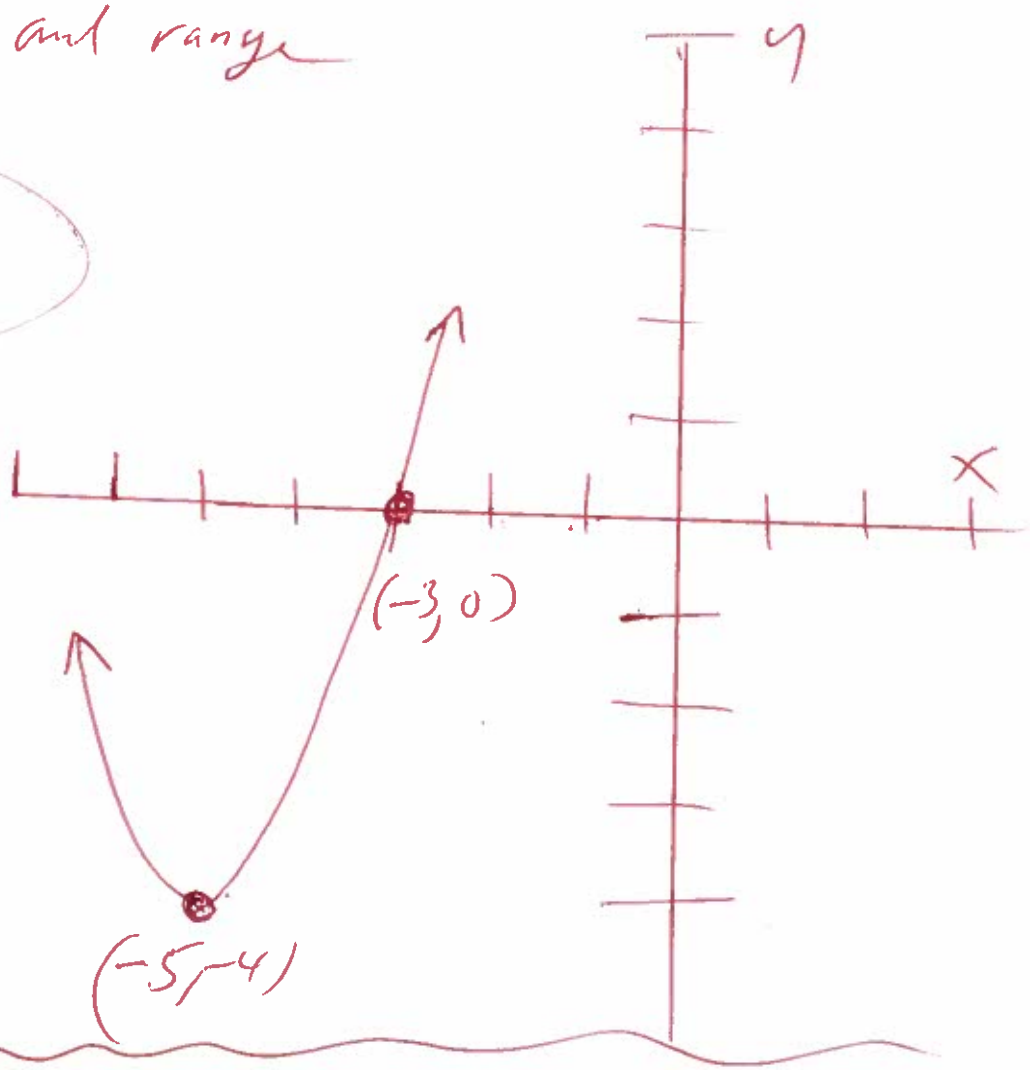
(22.) Find domain and range



left right
domain $(-\infty, \infty)$
all real numbers

bottom top
range $\{4\}$

(23.) Find domain and range

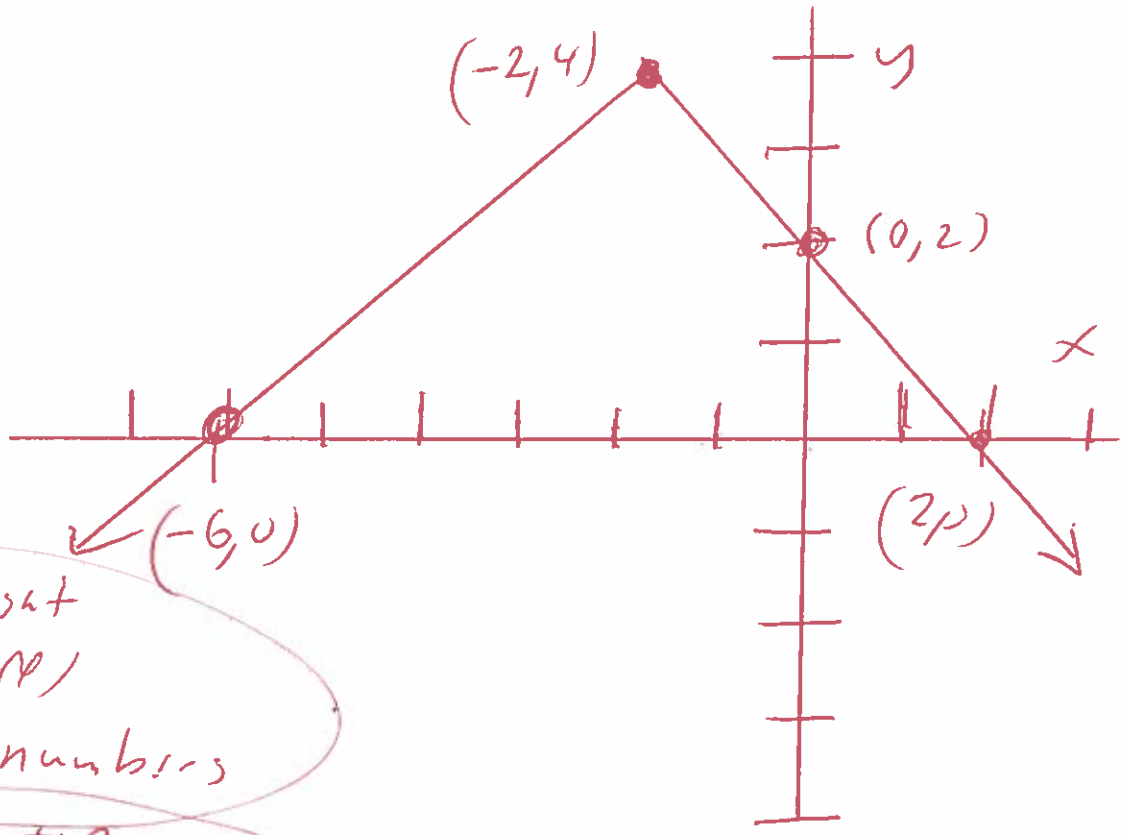


Left right
domain $(-\infty, \infty)$
all real numbers

range $[-4, \infty)$

$y \geq -4$

24.



Left right
domain $(-\infty, \infty)$
all real numbers

bottom top
range $(-\infty, 4]$

$y \leq 4$

25. determine whether the ordered pair is a solution of the system

$(3, -4)$
$x \quad y$

$3x+y=5$
$4x+3y=0$

$3(3)+(-4)=5$
$9-4=5$
$5=5$
Good ✓

$4(3)+3(-4)=0$
$12-12=0$
$0=0$
Good ✓

Yes this is a solution

(26) Solve by graphing

$x+y=-3$

$x+y=-4$

$x+y=-3$

$x+y-x=-3-x$

$y=-3-x$

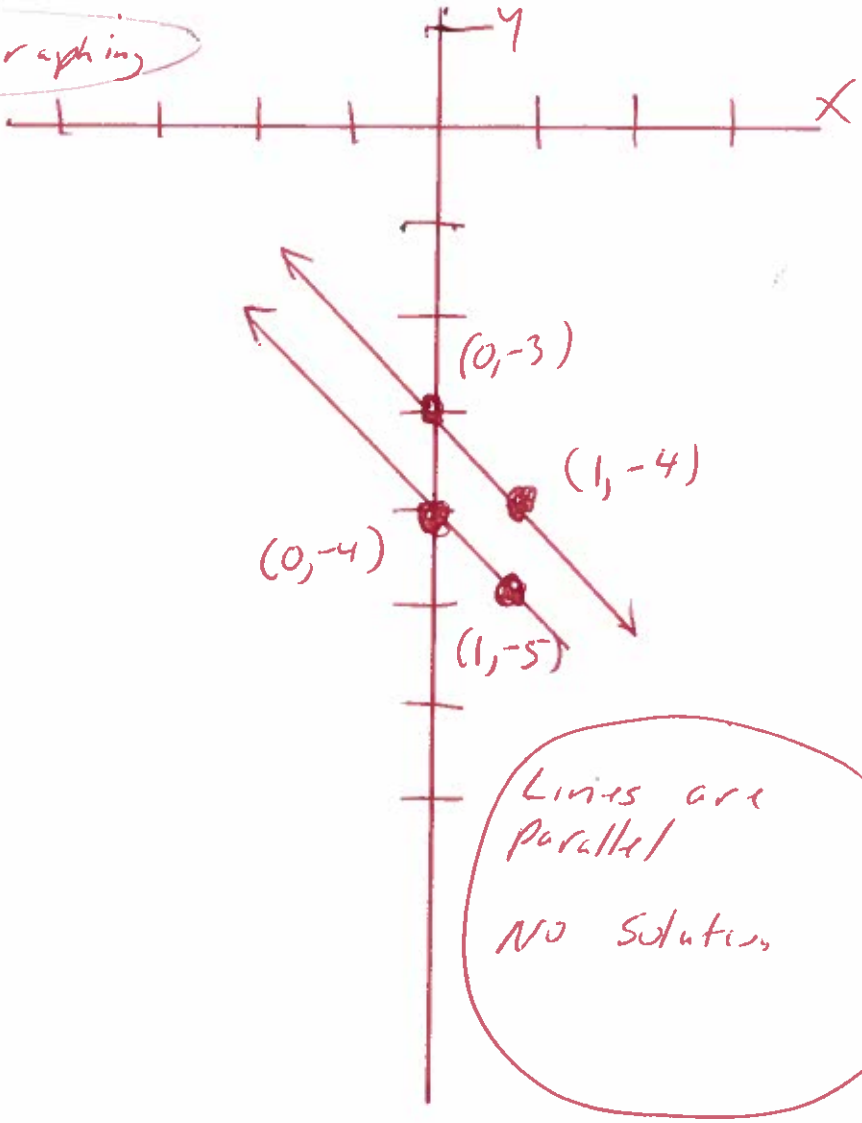
$y=-x-3$

$x+y=-4$

$x+y-x=-4-x$

$y=-4-x$

$y=-x-4$



Lines are parallel

NO Solution

$y=-x-3$

$y=-(0)-3$

$y=0-3$

$y=-3$

x	y
0	-3
1	-4

$y=-(1)-3$

$y=-1-3$

$y=-4$

$y=-x-4$

$y=-(0)-4$

$y=0-4$

$y=-4$

x	y
0	-4
1	-5

$y=-x-4$

$y=-(1)-4$

$y=-1-4$

$y=-5$

(27.) $y = 4x - 1$

$4y - 20x = -24$

$4(4x-1) - 20x = -24$ Subst

$16x - 4 - 20x = -24$

$-4x - 4 = -24$

$-4x - 4 + 4 = -24 + 4$

$-4x = -20$

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

$x = 5$

Subst

$y = 4x - 1$

$y = 4(5) - 1$

$y = 20 - 1$

$y = 19$

$(x, y) = (5, 19)$

28. $5x + y = -58$

$5x - y = 8$

$10x + 0 = -50$

$10x = -50$

$\frac{10x}{10} = \frac{-50}{10}$

$x = -5$

Subst

$5x + y = -58$

$5(-5) + y = -58$

$-25 + y = -58$

$-25 + y + 25 = -58 + 25$

$y = -33$

$(x, y) = (-5, -33)$

29. $3x+7y=-13$

$7x+3y=23$

$(3x+7y=-13)\ (-3)$

$(7x+3y=23)\ (7)$

$-9x-21y=39$

$49x+21y=161$

$40x=200$

$\frac{40x}{40}=\frac{200}{40}$

$x=5$

Subst

$3x+7y=-13$

$3(5)+7y=-13$

$15+7y=-13$

$15+7y-15=-13-15$

$7y=-28$

$\frac{7y}{7}=\frac{-28}{7}$

$y=-4$

$(x,y)=(5,-4)$

30.

$D + N = 50$

$.10D + .05N = 4.15$

$(1D + 1N = 50)(-.05)$

$(.10D + .05N = 4.15)(1)$

$-.05D - .05N = -2.5$

$.10D + .05N = 4.15$

$.05D + 0 = 1.65$

$.05D = 1.65$

$\frac{.05D}{.05} = \frac{1.65}{.05}$

$D = 33$

$(D, N) = (33, 17)$

Subst

$D + N = 50$

$33 + N = 50$

$33 + N - 33 = 50 - 33$

$N = 17$

31.

$3H + 5P = 13.00$

$5H + 2P = 13.75$

$(3H + 5P = 13.00)(-2)$

$(5H + 2P = 13.75)(5)$

$-6H - 10P = -26.00$

$25H + 10P = 68.75$

$19H + 0 = 42.75$

$19H = 42.75$

$\frac{19H}{19} = \frac{42.75}{19}$

$H = 2.25$

Subst

$3H + 5P = 13.00$

$3(2.25) + 5P = 13.00$

$6.75 + 5P = 13.00$

$6.75 + 5P - 6.75 = 13.00 - 6.75$

$5P = 6.25$

$\frac{5P}{5} = \frac{6.25}{5}$

$P = 1.25$

$(H, P) = (2.25, 1.25)$

(34.) $(4x^3y^3)^2 =$

$(4^1x^3y^3)^2 =$

$4^{1(2)}\ x^{3(2)}\ y^{3(2)} =$ Mult Power

$4^2x^6y^6 =$

$(4)(4)x^6y^6 =$

$16x^6y^6 =$

(33.) $\dfrac{45m^3n^7}{9m^2n^5} =$

$\dfrac{(5)(9)\,m^{3-2}\,n^{7-5}}{(9)} =$ rewrite

$5m^1n^2 =$

$5mn^2 =$

34. $(x+12)(x^3+2x-5) =$

$x^4+2x^2-5x+12x^3+24x-60 =$

$x^4+12x^3+2x^2+19x-60 =$

35. $(8x-1)(x^2-3x+1) =$

$8x^3-24x^2+8x-1x^2+3x-1 =$

$8x^3-25x^2+11x-1 =$

36. $(3a-7)^2 =$

$(3a-7)(3a-7) =$

$9a^2 - 21a - 21a + 49 =$

$9a^2 - 42a + 49 =$

37. $(a-1)(a+1) =$

$a^2 + 1a - 1a - 1 =$

$a^2 - 1 =$

38. $\dfrac{2^{-7}x^{-5}y^{3}}{2^{-4}x^{-8}y^{6}} =$

$\dfrac{2^{4}x^{8}y^{3}}{2^{7}x^{5}y^{6}} =$ FTW-ish

$\dfrac{x^{8-5}}{2^{7-4}y^{6-3}} =$

$\dfrac{x^{3}}{2^{3}y^{3}} =$

$\dfrac{x^{3}}{(2)(2)(2)y^{3}} =$

$\dfrac{x^{3}}{8y^{3}} =$

(39.) $20x^4y + 36xy^3 =$ factor

$20x^4y^1 + 36x^1y^3 =$

$4x^1y^1(5x^3 + 9y^2) =$

$4xy(5x^3 + 9y^2) =$

(40.) $2x + 24 + xy + 12y =$ factor (group)

$(2x + 24) + (xy + 12y) =$

$2(x + 12) + y(x + 12) =$

$(x + 12)(2 + y) =$

(41) $x^2 - x - 42$ factor

42·1 Possible
21·2
7·6
14 3

$(x+6)(x-7) =$

Check

$(x+6)(x-7) =$

$x^2 - 7x + 6x - 42 =$

$x^2 - 1x - 42 =$

$x^2 - x - 42$ = Good

(42) $3x - 10 + x^2 =$ factor

$x^2 + 3x - 10 =$ rewrite

Possible
10·1
2·5

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

Check

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

$x^2 + 5x - 2x - 10 =$

$x^2 + 3x - 10$ Good

(43) $81x^2 - 49 =$ factor

$(9x)^2 - (7)^2 =$ rewrite

$(9x+7)(9x-7) =$

formula

$a^2 - b^2 =$

$(a+b)(a-b)$

(44) Solve

$(2x+1)(5x-3) = 0$

Let $2x+1=0$ OR $5x-3=0$

$2x+1-1=0-1$ OR $5x-3+3=0+3$

$2x = -1$ OR $5x = 3$

$\frac{2x}{2} = \frac{-1}{2}$ OR $\frac{5x}{5} = \frac{3}{5}$

$x = -\frac{1}{2}$ OR $x = \frac{3}{5}$

45. Solve

$x^2 + 2x - 80 = 0$

$(x - 8)(x + 10) = 0$

Let $x - 8 = 0$ OR $x + 10 = 0$

$x - 8 + 8 = 0 + 8$ OR $x + 10 - 10 = 0 - 10$

$x = 8$ OR $x = -10$

Possible
80.1
40.2
20.4
10.8
5.16

46. Solve

$2x^2 - 7x - 9 = 0$

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

Let $2x - 9 = 0$ OR $x + 1 = 0$

$2x - 9 + 9 = 0 + 9$ OR $x + 1 - 1 = 0 - 1$

$2x = 9$

$\frac{2x}{2} = \frac{9}{2}$

OR $x = -1$

$x = \frac{9}{2}$

Possible
2.1
9.1
3.3

(47) $\frac{z^3}{20z} \cdot \frac{5}{2z^2} =$ Simplify

$\frac{5z^3}{40z^{1+2}} =$

$\frac{5z^3}{40z^3} =$

$\frac{1(5)z^3}{(8)(5)z^3} =$

$\frac{1}{8} =$

48. $\frac{2x^{13}}{7x^6} \div \frac{4x}{14x^3} =$ simplify

$$\frac{2x^{13}}{7x^6} \cdot \frac{14x^3}{4x^1} =$$

$$\frac{28x^{13+3}}{28x^{6+1}} =$$

$$\frac{28x^{16}}{28x^7} =$$

$$\frac{28x^{16-7}}{28} =$$

$$x^9 =$$

(49) $\frac{x^2-8x}{x-6} + \frac{12}{x-6} =$ Simplify

$\frac{(x^2-8x)+(12)}{x-6} =$

$\frac{x^2-8x+12}{x-6} =$

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

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

$x-2 =$

Possible
12.1
6.2
3.4

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

graph

x	f(x)
0	2
6	−3

$f(0) = -\frac{5}{6}(0) + 2$

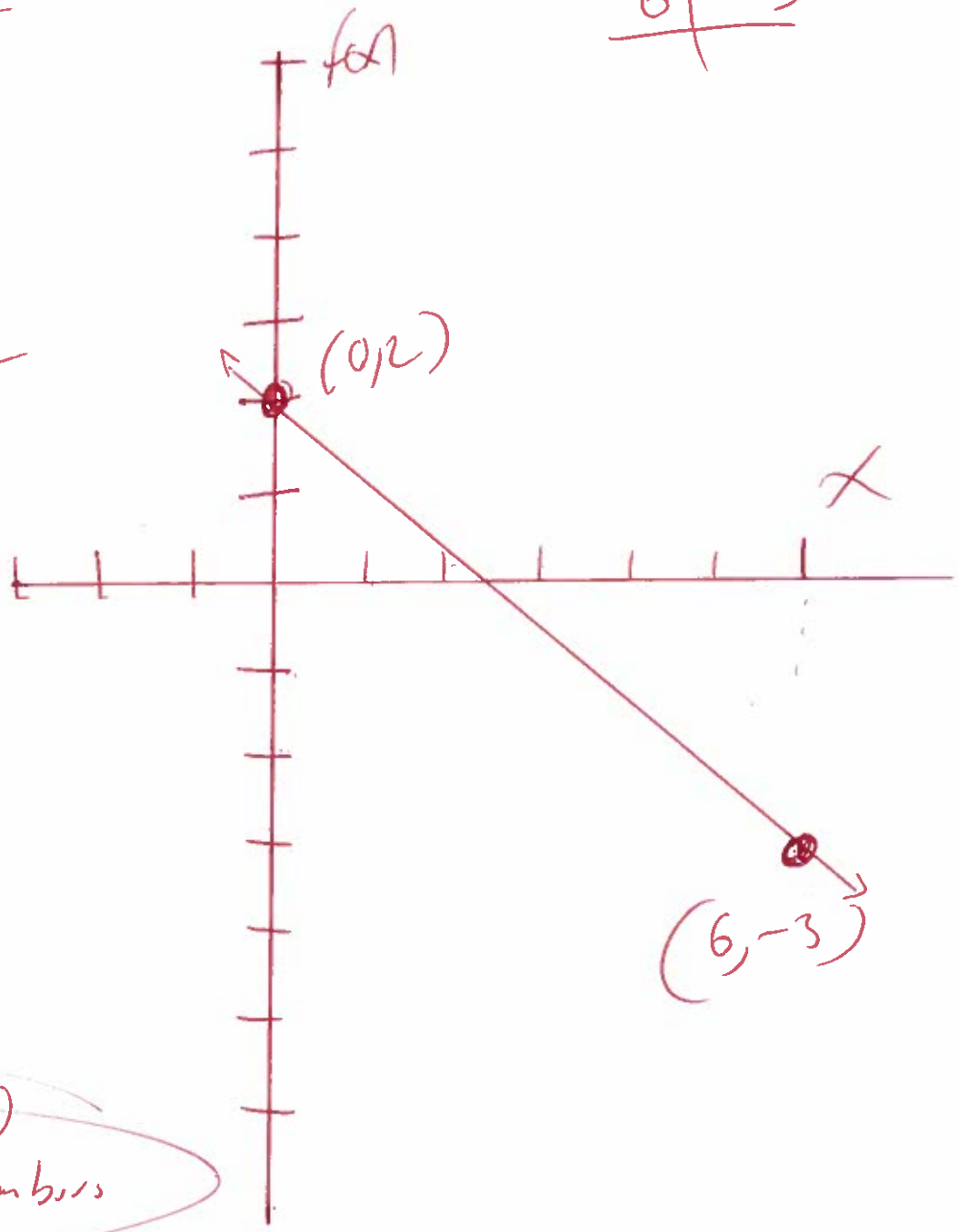
$f(0) = 0 + 2$

$f(0) = 2$

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

$f(6) = -5 + 2$

$f(6) = -3$



domain $(-\infty, \infty)$
all real numbers

range $(-\infty, \infty)$
all real numbers

51.

$f(x) = -3x + 9$

graph

x	f(x)
0	9
1	6

$f(0) = -3(0) + 9$

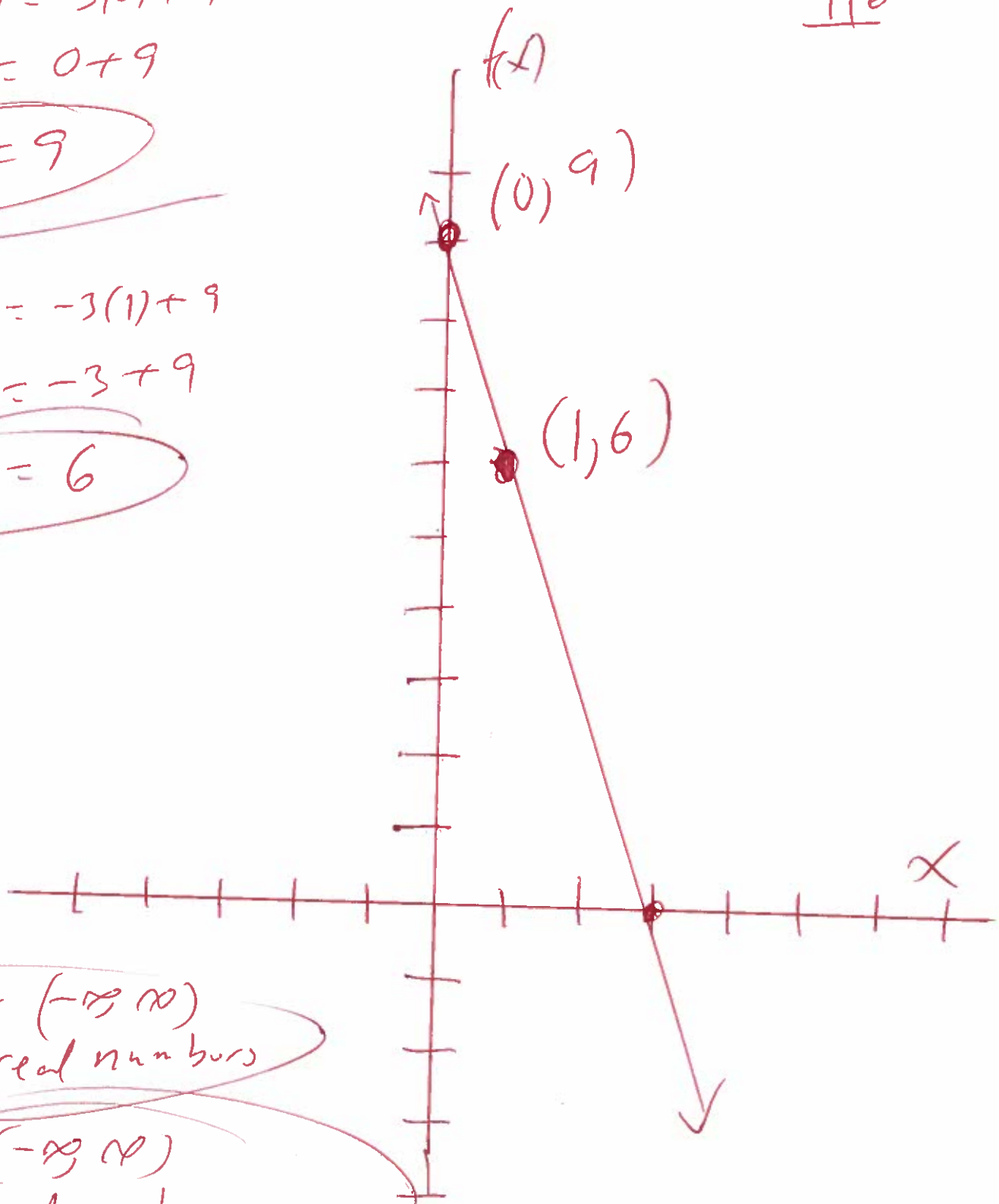
$f(0) = 0 + 9$

$f(0) = 9$

$f(1) = -3(1) + 9$

$f(1) = -3 + 9$

$f(1) = 6$



domain $(-\infty, \infty)$
all real numbers

range $(-\infty, \infty)$
all real numbers

(52) find an equation of the line through $(2, 4)$ perpendicular to $f(x) = -3x + 4$

$x_1 \quad y_1$

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

point $= (2, 4)$, $x_1 \quad y_1$

$m_{per} = \frac{1}{3} = m$ new slope

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

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

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

$y - 4 = \frac{1}{3}x - \frac{2}{3}$

$y - 4 + 4 = \frac{1}{3}x - \frac{2}{3} + 4$

$y = \frac{1}{3}x - \frac{2}{3} + \frac{4}{1}\left(\frac{3}{3}\right)$

$y = \frac{1}{3}x - \frac{2}{3} + \frac{12}{3}$

$y = \frac{1}{3}x + \frac{-2+12}{3}$

$y = \frac{1}{3}x + \frac{10}{3}$

53.

graph

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

x	f(x)
-1	6
0	5
1	6

$f(-1) = (-1)^2 + 5$

$f(-1) = (-1)(-1) + 5$

$f(-1) = 1 + 5$

$f(-1) = 6$

$f(0) = (0)^2 + 5$

$f(0) = (0)(0) + 5$

$f(0) = 0 + 5$

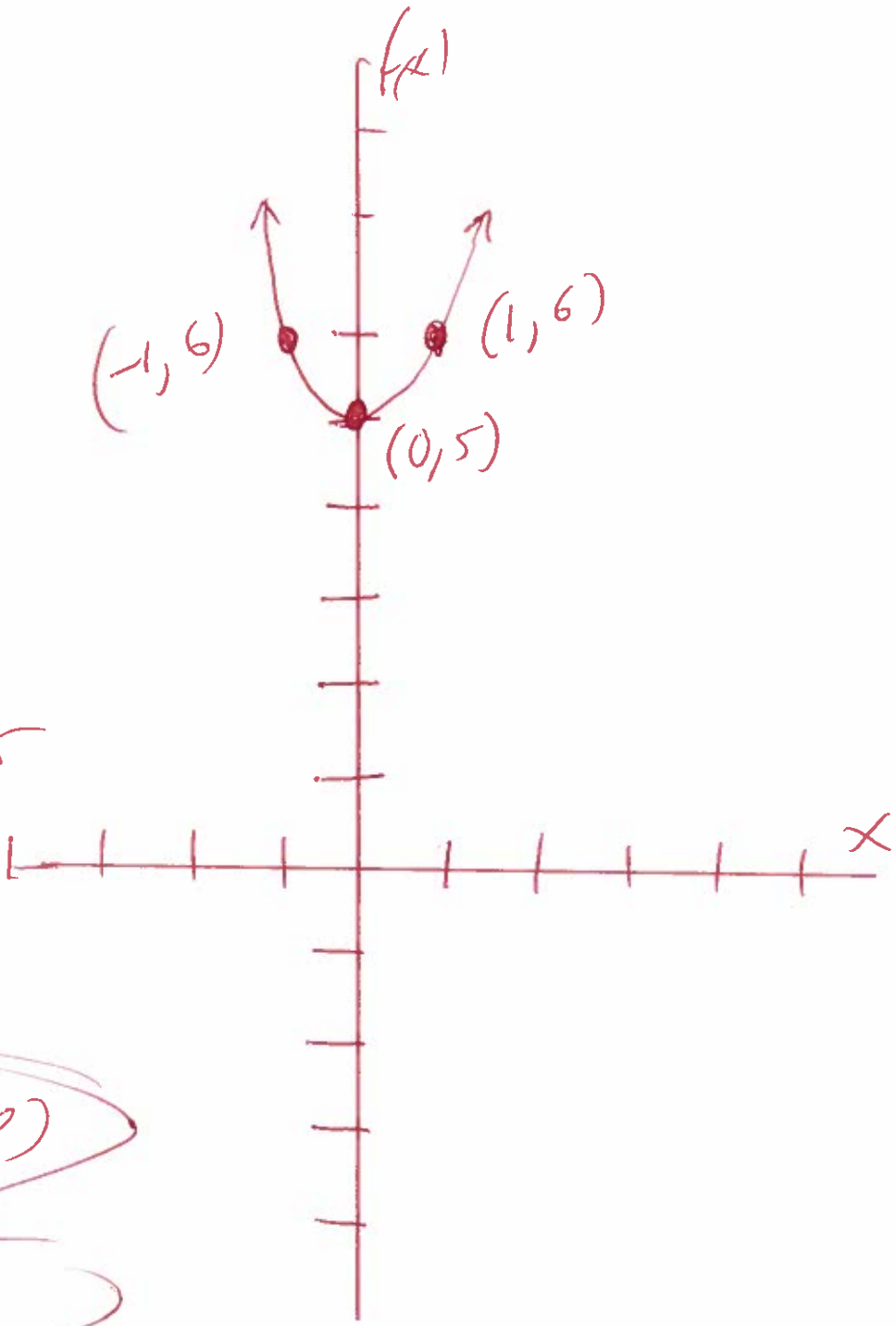
$f(0) = 5$

$f(1) = (1)^2 + 5$

$f(1) = (1)(1) + 5$

$f(1) = 1 + 5$

$f(1) = 6$



Domain $(-\infty, \infty)$
all real numbers

Range $[5, \infty)$

$y \geq 5$

54. $f(x) = \sqrt{x} + 5$ graph

x	f(x)
0	5
1	6
4	7
9	8

$f(0) = \sqrt{0} + 5$

$f(0) = 0 + 5$

$f(0) = 5$

$f(1) = \sqrt{1} + 5$

$f(1) = 1 + 5$

$f(1) = 6$

$f(4) = \sqrt{4} + 5$

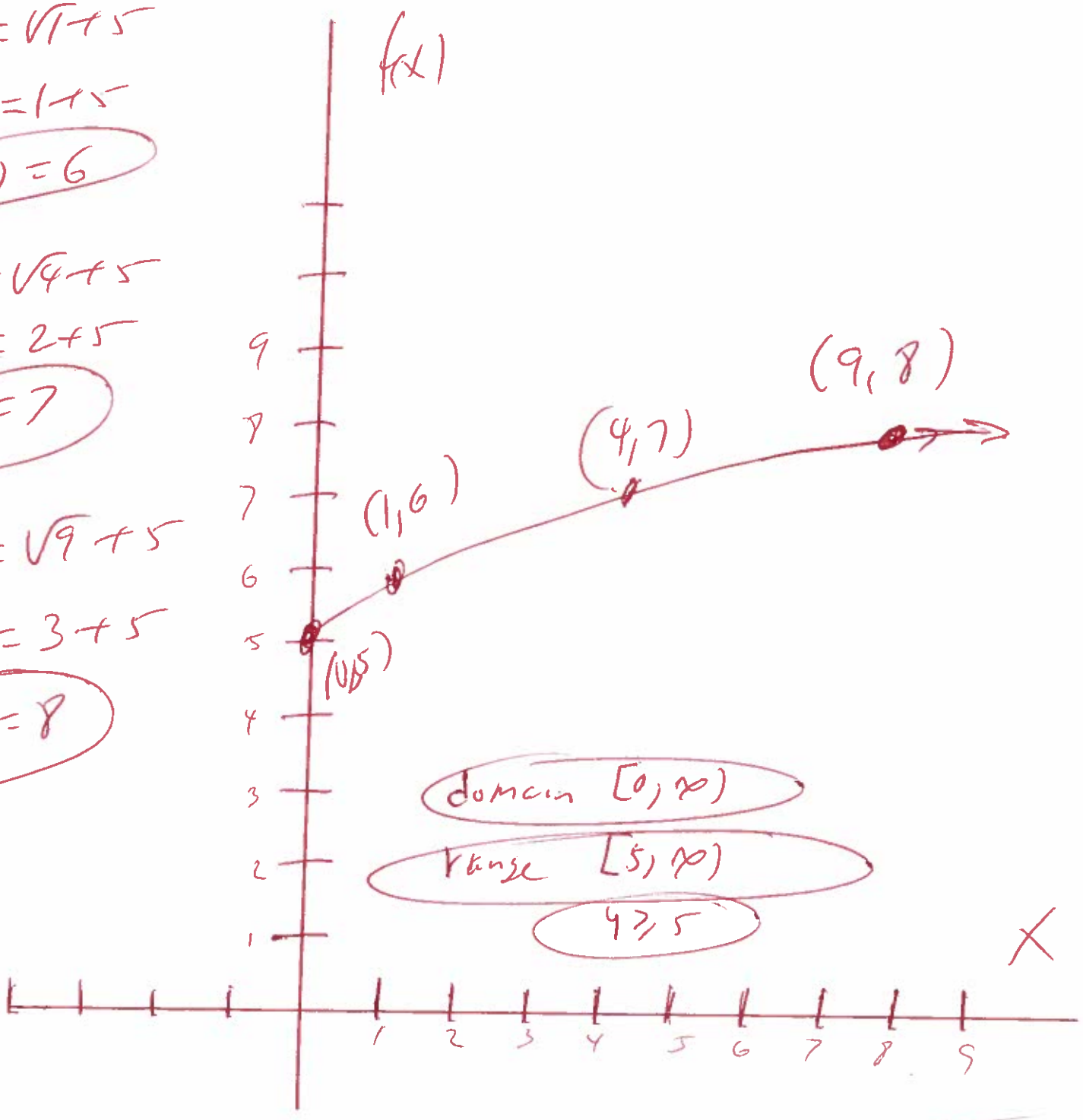
$f(4) = 2 + 5$

$f(4) = 7$

$f(9) = \sqrt{9} + 5$

$f(9) = 3 + 5$

$f(9) = 8$



domain $[0, \infty)$

range $[5, \infty)$

$y \geq 5$

55. y varies directly as x, find the direct variation equation for the situation.

$y = 3$ when $x = 21$

$y = kx$ varies directly

$3 = k(21)$

$3 = 21k$

$\frac{3}{21} = \frac{21k}{21}$

$\frac{3}{21} = k$

$\frac{3(1)}{3(7)} = k$

$\frac{1}{7} = k$

$y = kx$

$y = \frac{1}{7}x$

(56) the amount of water used to take a shower is directly proportional to the amount of time that the shower is in use. A shower lasting 23 minutes requires 18.4 gallons of water. Find the amount of water used in a shower lasting 7 minutes.

23 minute → 18.4 gallons water

7 minute → ? gallons water

$M = kG$

$23 = k(18.4)$

$23 = 18.4k$

$\frac{23}{18.4} = \frac{18.4k}{18.4}$

$1.25 = k$

$M = kG$

$M = 1.25G$

$7 = 1.25G$

$\frac{7}{1.25} = \frac{1.25G}{1.25}$

$5.6 = G$

(7 minutes, 5.6 gallons water)

57. $13 \le 4t + 5 \le 29$

$13 - 5 \le 4t + 5 - 5 \le 29 - 5$

$8 \le 4t \le 24$

$\frac{8}{4} \le \frac{4t}{4} \le \frac{24}{4}$

$2 \le t \le 6$

$[2, 6]$

58. $|x+3| > 4$

formula

$|x| > a$

$x < -a$ or $x > a$

$x + 3 < -4$ or $x + 3 > 4$

$x + 3 - 3 < -4 - 3$ or $x + 3 - 3 > 4 - 3$

$x < -7$ or $x > 1$

$(-\infty, -7) \cup (1, \infty)$

(59.) determine whether the ordered pair given is a solution of the linear inequality in two variables

$x + 2y > -3$

$(4, -3)$
$x \quad y$

$(4) + 2(-3) > -3$

$4 - 6 > -3$

$-2 > -3$

Yes $(4, -3)$ is a solution

60) $x + y \leq -2$

graph

$x + y - x \leq -2 - x$

$y \leq -2 - x$

$y \leq -x - 2$

x	y
0	-2
1	-3

$y = -x - 2$

$y = -(0) - 2$

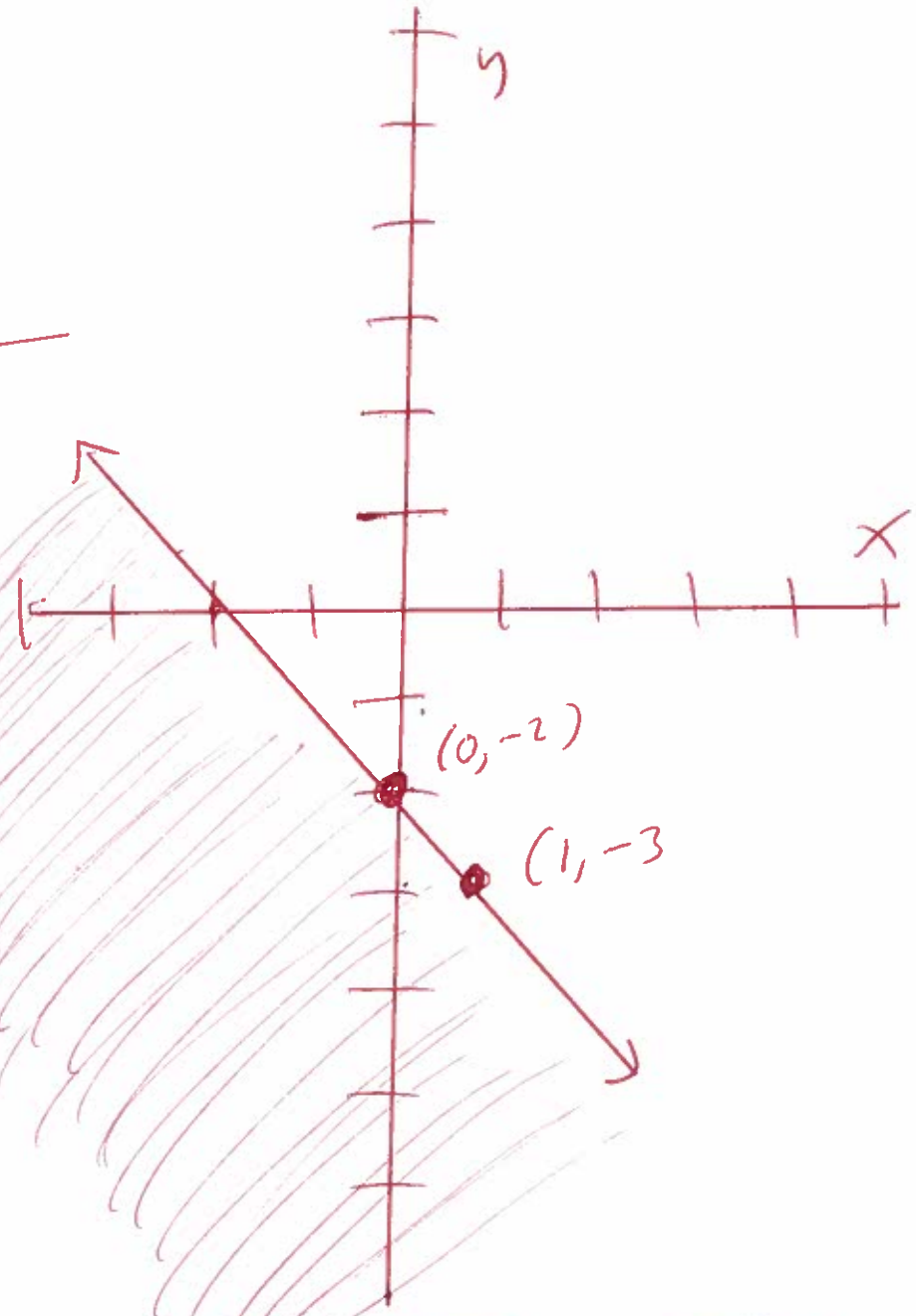
$y = 0 - 2$

$y = -2$

$y = -(1) - 2$

$y = -1 - 2$

$y = -3$



61. $\sqrt{16x^{10}} =$

$\sqrt[2]{16x^{10}} =$

$\sqrt[2]{4^2x^{10}} =$

$4^{2/2}x^{10/2}$ = divide powers

$4^1x^5 =$

$4x^5 =$

---

62. $(243x^{25})^{1/5} =$

$(3^5x^{25})^{1/5} =$

$3^{5(\frac{1}{5})}x^{25(\frac{1}{5})}$ = Multiply powers

$3^{\frac{5}{5}}x^{\frac{25}{5}} =$

$3^1x^5 =$

$3x^5 =$

Prime 2, 3, 5, 7, ...

3 | 243
3 | 81
3 | 27
3 | 9
3 | 3
1

(63.) $\sqrt{20} =$

$\sqrt{4 \cdot 5} =$

$\sqrt{4}\sqrt{5} =$

$2\sqrt{5} =$

Primes 2, 3, 5, 7 ...

2 | 20
2 | 10
5 | 5
1

(64.) $\sqrt{320k^7q^8} =$

$\sqrt{2^6 \cdot 5^1 k^7 q^8} =$

$\sqrt{2^6 \cdot 5^1 k^6 k^1 q^8} =$ rewrite

$2^{6/2} k^{6/2} q^{8/2} \sqrt{5^1 k^1} =$ divide powers

$2^3 k^3 q^4 \sqrt{5k} =$

$(2)(2)(2) k^3 q^4 \sqrt{5k} =$

$8k^3q^4\sqrt{5k} =$

Primes 2, 3, 5, 7 ..

2 | 320
2 | 160
2 | 80
2 | 40
2 | 20
2 | 10
5 | 5
1

65. $\sqrt[3]{512x^4y^5}$ =

$\sqrt[3]{2^9x^4y^5}$ =

$\sqrt[3]{2^9x^3x^1y^3y^2}$ = rewrite

$2^{9/3}x^{3/3}y^{3/3}\sqrt[3]{x^1y^2}$ = divide powers

$2^3x^1y^1\sqrt[3]{x^1y^2}$ =

$(2)(2)(2)\,xy\sqrt[3]{xy^2}$ =

$8xy\sqrt[3]{xy^2}$ =

Prime 2, 3, 5, 7 ...

2 | 512
2 | 256
2 | 128
2 | 64
2 | 32
2 | 16
2 | 8
2 | 4
2 | 2
1

66. $\dfrac{\sqrt{5}-\sqrt{6}}{\sqrt{5}+\sqrt{6}}$

rationalize the denominator

$\left(\dfrac{\sqrt{5}-\sqrt{6}}{\sqrt{5}+\sqrt{6}}\right)\left(\dfrac{\sqrt{5}-\sqrt{6}}{\sqrt{5}-\sqrt{6}}\right)$ = mult

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

$$\frac{5-2\sqrt{5}\sqrt{6}+6}{5-6}=$$

$$\frac{11-2\sqrt{5}\sqrt{6}}{-1}=$$

$$\frac{11-2\sqrt{30}}{-1}=$$

$$\frac{11}{-1}-\frac{2\sqrt{30}}{-1}=$$

$$-11+2\sqrt{30}=$$

$$2\sqrt{30}-11=$$

(6?) $\sqrt{x+4} = 8$

$(\sqrt{x+4})^2 = (8)^2$

$x+4 = 64$

$x+4-4 = 64-4$

$x = 60$

Check

$\sqrt{x+4} = 8$

$\sqrt{(60)+4} = 8$

$\sqrt{60+4} = 8$

$\sqrt{64} = 8$

$8 = 8$

Good

(68.) $(x-5)^2 = 36$

$\sqrt{(x-5)^2} = \pm\sqrt{36}$

$x-5 = \pm 6$

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

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

$x=-1$ or $x=11$

Check

$(x-5)^2=36$

$(-1-5)^2=36$

$(-6)^2=36$

$(-6)(-6)=36$

$36=36$

Good

$(x-5)^2=36$

$(11-5)^2=36$

$(6)^2=36$

$(6)(6)=36$

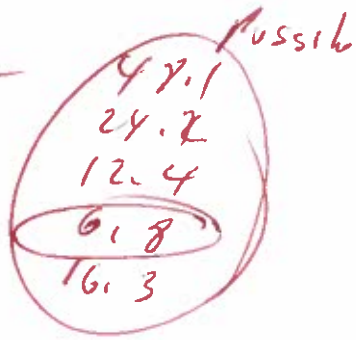
$36=36$

Good

(69) $x^2 - 2x - 48 = 0$

$(x+6)(x-8) = 0$

Solve



$x+6=0$ or $x-8=0$

$x+6-6=0-6$ or $x-8+8=0+8$

$x=-6$ or $x=8$

Use Quadratic formula

$1x^2 - 2x - 48 = 0$

$a=1,\ b=-2,\ c=-48$

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

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-48)}}{2(1)}$$

$$x = \frac{2 \pm \sqrt{4+192}}{2}$$

$$x = \frac{2 \pm \sqrt{196}}{2}$$

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

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

$x = 1 \pm 7$

$x = 1-7$ or $x = 1+7$

$x = -6$ or $x = 8$

(70) $x^2+24x+144=0$ Solve

$(x+12)(x+12)=0$

$x+12=0$ or $x+12=0$

$x+12-12=0-12$ or $x+12-12=0-12$

$x=-12$ or $x=-12$

144.1 Possible
72.2
36.4
18.8
9.16
3.48
12.12

Use Quad formula

$1x^2+24x+144=0$

$a=1,\ b=24,\ c=144$

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

$$x=\frac{-(24)\pm\sqrt{(24)^2-4(1)(144)}}{2(1)}$$

$$x=\frac{-24\pm\sqrt{576-576}}{2}$$

$$x=\frac{-24\pm\sqrt{0}}{2}$$

$$x=\frac{-24\pm 0}{2}$$

$$x=-\frac{24}{2}\pm\frac{0}{2}$$

$x=-12\pm 0$

$x=-12-0$ or $x=-12+0$

$x=-12$ or $x=-12$

(11) $x^2 - 8x + 20 = 0$ Solve use Quad formula

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

$a = 1,\ b = -8,\ c = 20$

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

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(20)}}{2(1)}$$

$$x = \frac{8 \pm \sqrt{64 - 80}}{2}$$

$$x = \frac{8 \pm \sqrt{-16}}{2}$$

$$x = \frac{8 \pm 4i}{2}$$

$$x = \frac{8}{2} \pm \frac{4i}{2}$$

$x = 4 \pm 2i$

$x = 4 + 2i$ or $x = 4 - 2i$

(72) $2x^2 - 7x - 9 = 0$ Solve

$a = 2,\ b = -7,\ c = -9$

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

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(2)(-9)}}{2(2)}$$

$$x = \frac{7 \pm \sqrt{49 + 72}}{4}$$

$$x = \frac{7 \pm \sqrt{121}}{4}$$

$$x = \frac{7 \pm 11}{4}$$

$$x = \frac{7+11}{4} \text{ or } x = \frac{7-11}{4}$$

$$x = \frac{18}{4} \text{ OR } x = \frac{-4}{4}$$

$$x = \frac{2(9)}{2(2)} \text{ or } x = -1$$

$$x = \frac{9}{2}$$

73. $f(x) = x^2 - 4$

Graph

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

$f(-2) = (-2)(-2) - 4$

$f(-2) = 4 - 4$

$f(-2) = 0$

$f(-1) = (-1)^2 - 4$

$f(-1) = (-1)(-1) - 4$

$f(-1) = 1 - 4$

$f(-1) = -3$

$f(0) = (0)^2 - 4$

$f(0) = (0)(0) - 4$

$f(0) = 0 - 4$

$f(0) = -4$

$f(1) = (1)^2 - 4$

$f(1) = (1)(1) - 4$

$f(1) = 1 - 4$

$f(1) = -3$

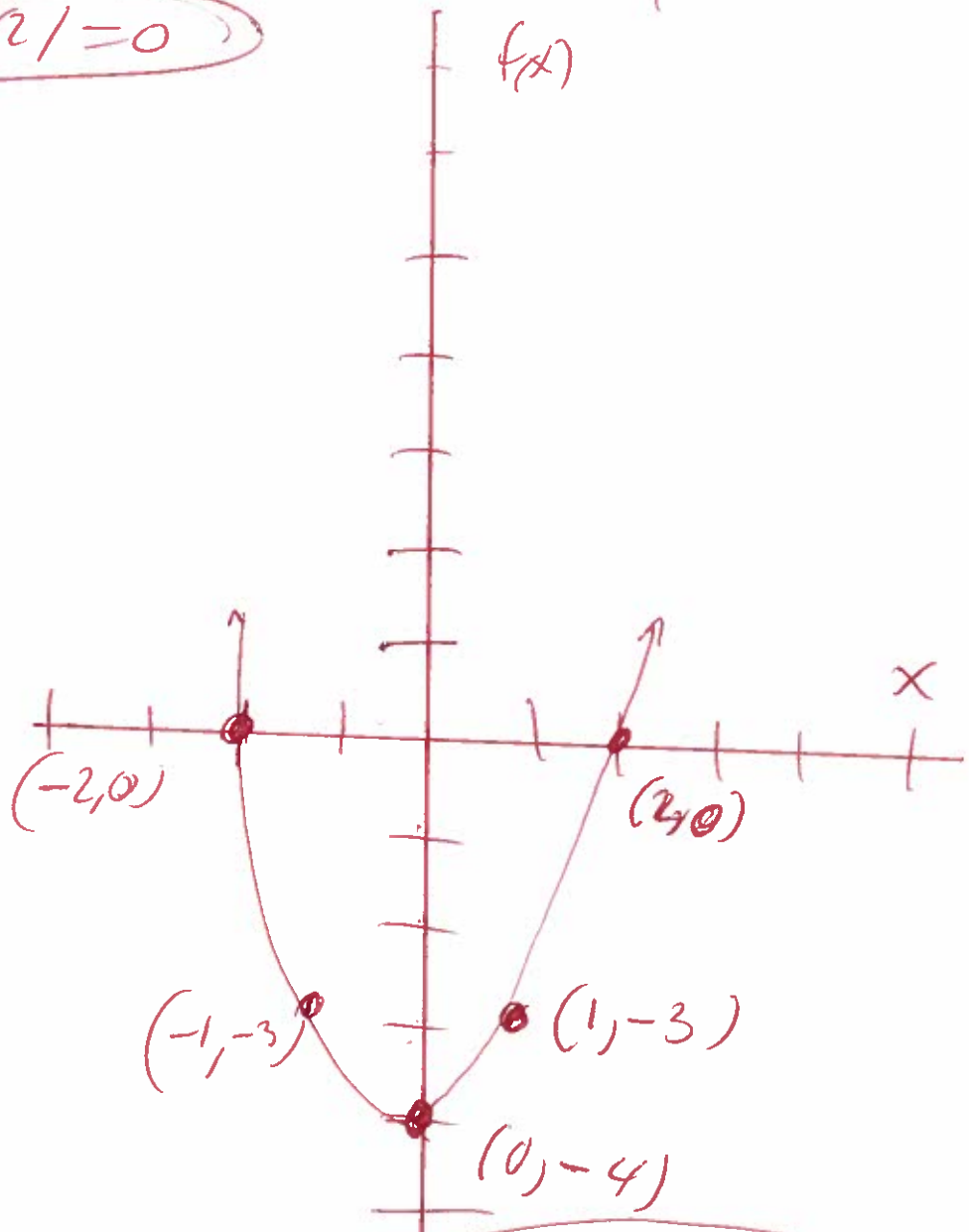
$f(2) = (2)^2 - 4$

$f(2) = (2)(2) - 4$

$f(2) = 4 - 4$

$f(2) = 0$

x	f(x)
-2	0
-1	-3
0	-4
1	-3
2	0



Vertex = (0, -4)

domain $(-\infty, \infty)$
all real numbers

range $[-4, \infty)$
$y \geq -4$

(74) $f(x) = (x+5)^2$

graph

x	f(x)
-6	1
-5	0
-4	1

$f(-6) = (-6+5)^2$

$f(-6) = (-1)^2$

$f(-6) = (-1)(-1)$

$f(-6) = 1$

$f(-5) = (-5+5)^2$

$f(-5) = (0)^2$

$f(-5) = (0)(0)$

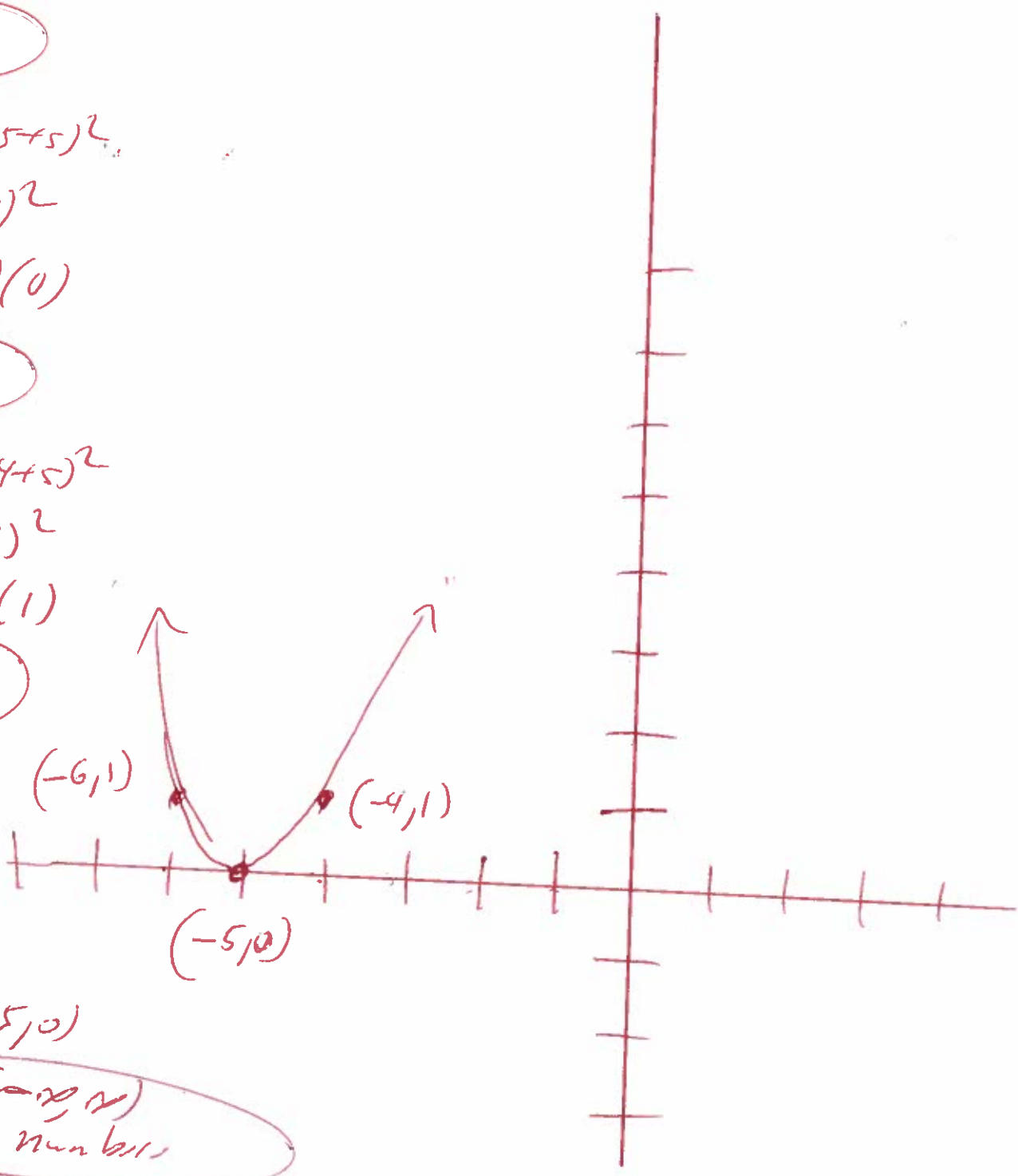
$f(-5) = 0$

$f(-4) = (-4+5)^2$

$f(-4) = (1)^2$

$f(-4) = (1)(1)$

$f(-4) = 1$



Vertex = (-5, 0)

Domain $(-\infty, \infty)$
all real numbers

Range $[0, \infty)$

$y \geq 0$

15. $f(x) = (x+6)^2 + 4$ graph

$f(-7) = (-7+6)^2 + 4$

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

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

$f(-7) = 1 + 4$

$f(-7) = 5$

x	f(x)
-7	5
-6	4
-5	5

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

$f(-6) = (0)^2 + 4$

$f(-6) = (0)(0) + 4$

$f(-6) = 0 + 4$

$f(-6) = 4$

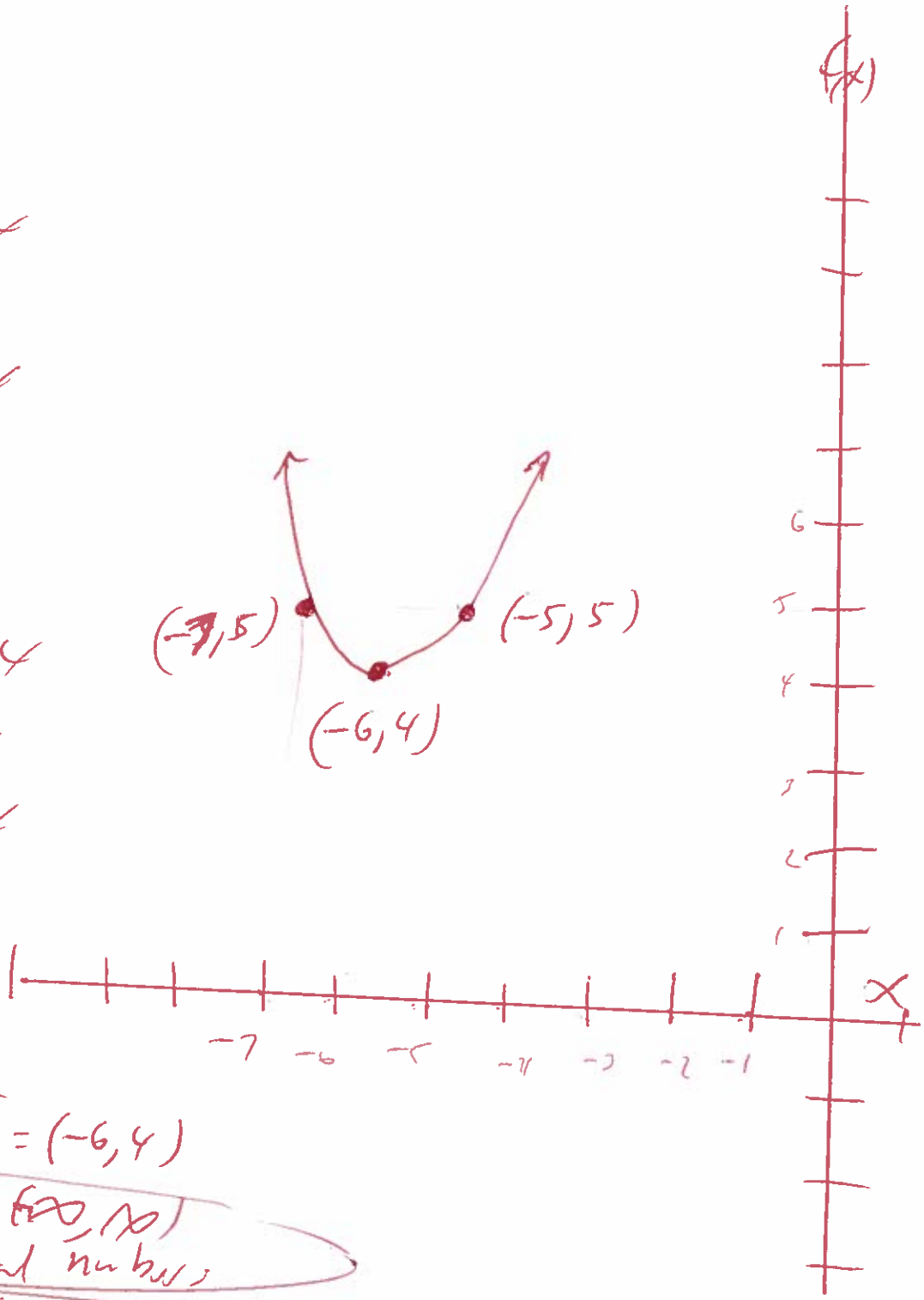
$f(-5) = (-5+6)^2 + 4$

$f(-5) = (1)^2 + 4$

$f(-5) = (1)(1) + 4$

$f(-5) = 1 + 4$

$f(-5) = 5$



vertex = (-6, 4)

domain = $(-\infty, \infty)$
all real numbers

range $[4, \infty)$
$y \geq 4$

(76) $f(x) = -x^2 - 10x + 9$ graph

$a = -1,\ b = -10,\ c = 9$

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

Vertex $= \left(\frac{-(-10)}{2(-1)},\ f\left(\frac{(-10)}{2(-1)}\right)\right)$

Vertex $= \left(\frac{10}{-2},\ f\left(\frac{10}{-2}\right)\right)$

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

Vertex $= (-5,\ -(-5)^2 - 10(-5) + 9)$

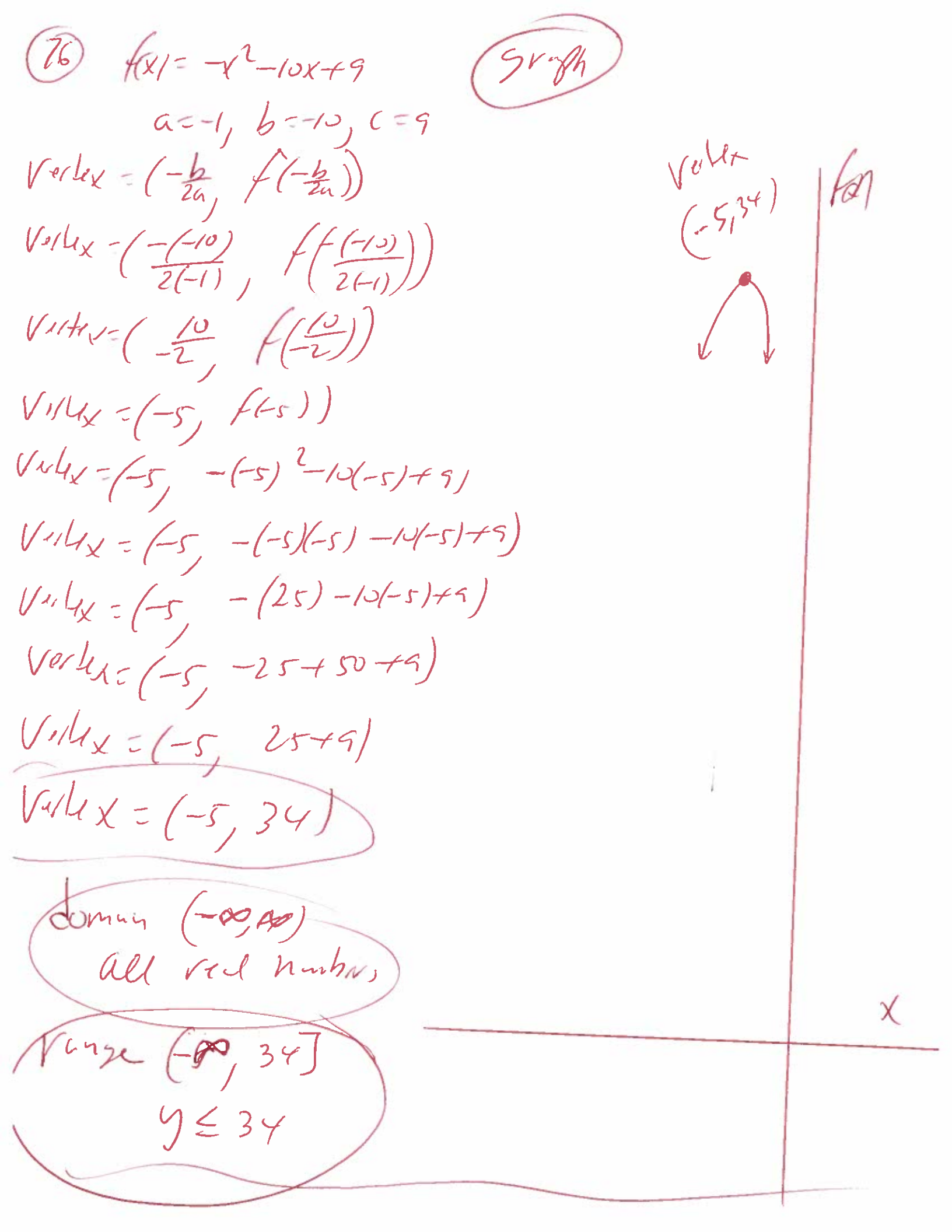
Vertex $= (-5,\ -(-5)(-5) - 10(-5) + 9)$

Vertex $= (-5,\ -(25) - 10(-5) + 9)$

Vertex $= (-5,\ -25 + 50 + 9)$

Vertex $= (-5,\ 25 + 9)$

Vertex $= (-5, 34)$



domain $(-\infty, \infty)$
all real numbers

range $(-\infty, 34]$
$y \leq 34$

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

$a = 1,\ b = 4,\ c = -5$

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

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

Vertex $= (-2, -9)$

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

find x-intercept let $y = 0$

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

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

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

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

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

$(1, 0)$ OR $(-5, 0)$ x-intercepts

Graph

$f(x): y = x^2 + 4x - 5$

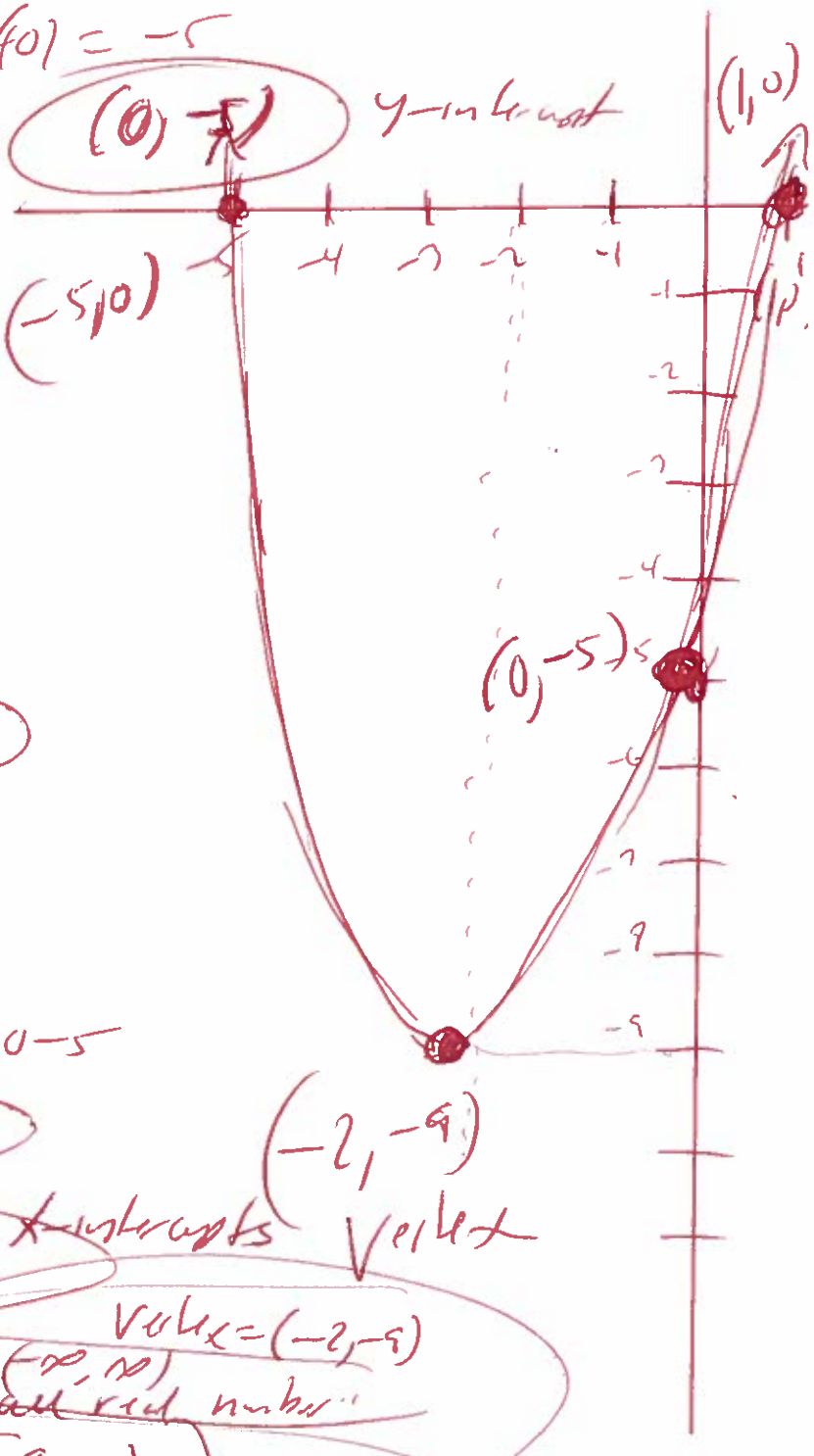
find y-intercept let $x = 0$

$f(0) = (0)^2 + 4(0) - 5$

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

$f(0) = 0 + 0 - 5$

$f(0) = -5$



Vertex $= (-2, -9)$

domain $(-\infty, \infty)$ all real numbers

range $[-9, \infty)$

$y \geq -9$

(78) $f(x) = -x^2 - 6x - 5$ Graph

$a = -1,\ b = -6,\ c = -5$

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

$\text{Vertex} = \left(\frac{-(-6)}{2(-1)}, f\left(\frac{-(-6)}{2(-1)}\right)\right)$

$\text{Vertex} = \left(\frac{6}{-2}, f\left(\frac{6}{-2}\right)\right)$

$\text{Vertex} = (-3, f(-3))$

$\text{Vertex} = (-3, -(-3)^2 - 6(-3) - 5)$

$\text{Vertex} = (-3, -(-3)(-3) - 6(-3) - 5)$

$\text{Vertex} = (-3, -(9) - 6(-3) - 5)$

$\text{Vertex} = (-3, -9 + 18 - 5)$

$\text{Vertex} = (-3, 9 - 5)$

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

$y = f(x) = -x^2 - 6x - 5$

find x-intercept let $y = 0$

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

$0 = -1(x^2 + 6x + 5)$

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

$-1 \neq 0$ or $x + 1 = 0$ or $x + 5 = 0$

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

$x = -1$ or $x = -5$

$(-1, 0)$ or $(-5, 0)$ x-intercept

$f(x) = y = -x^2 - 6x - 5$

find y-intercept let $x = 0$

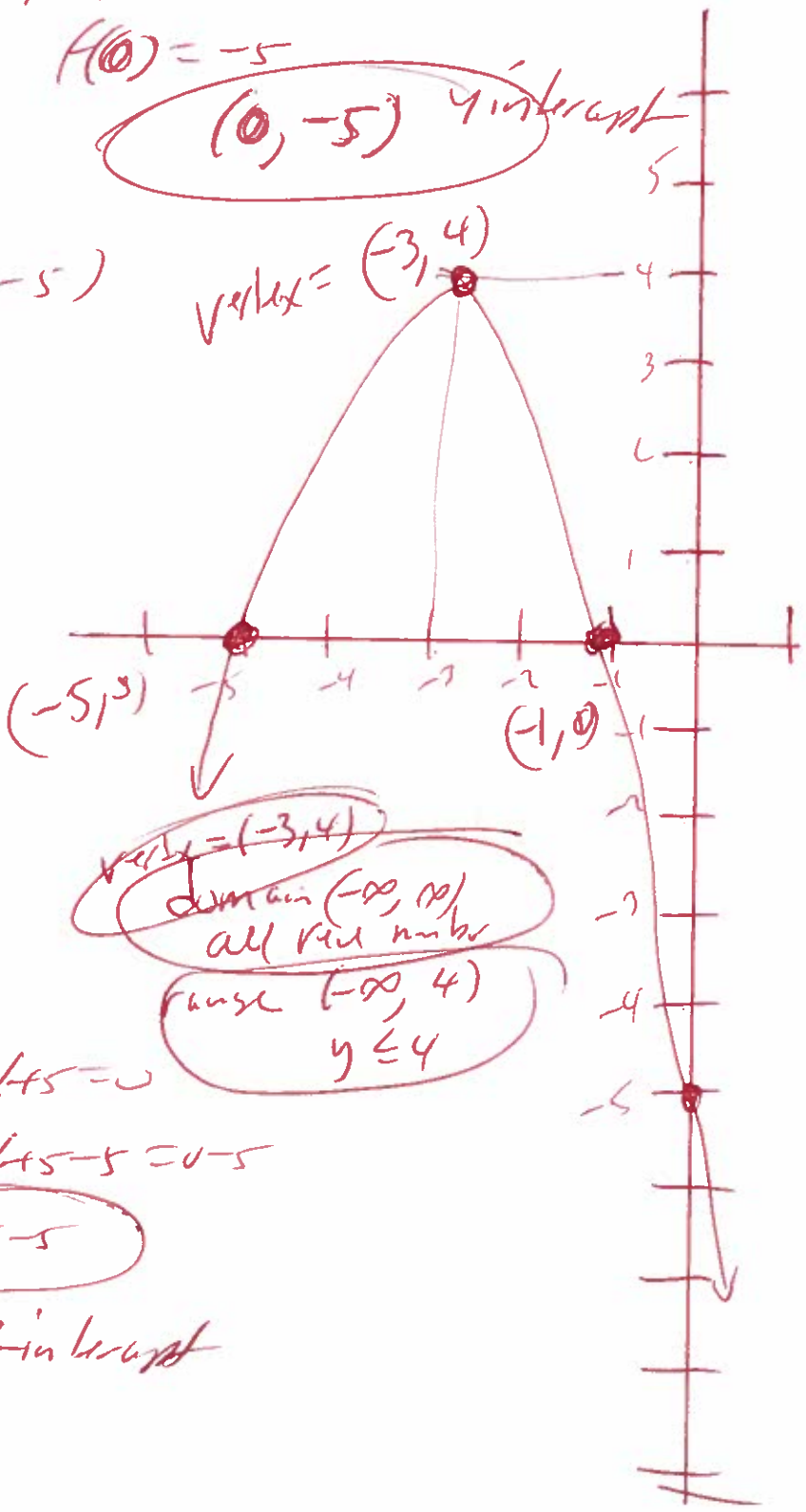
$f(0) = -(0)^2 - 6(0) - 5$

$f(0) = -(0)(0) - 6(0) - 5$

$f(0) = 0 - 0 - 5$

$f(0) = -5$

$(0, -5)$ y-intercept



Vertex $= (-3, 4)$

Domain $(-\infty, \infty)$ all real number

Range $(-\infty, 4)$ $y \leq 4$

(79) $f(x) = -x^2 - 6x$ (graph)

$a = -1, b = -6, c = 0$

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

Vertex $= \left(-\frac{(-6)}{2(-1)}, f\left(\frac{-(-6)}{2(-1)}\right)\right)$

Vertex $= \left(\frac{6}{-2}, f\left(\frac{6}{-2}\right)\right)$

Vertex $= (-3, f(-3))$

Vertex $= (-3, -(-3)^2 - 6(-3))$

Vertex $= (-3, -(-3)(-3) - 6(-3))$

Vertex $= (-3, -(9) - 6(-3))$

Vertex $= (-3, -9 + 18)$

Vertex $= (-3, 9)$

$y = f(x) = -x^2 - 6x$

Find x-intercept let $y = 0$

$0 = -x^2 - 6x$

$0 = -x(x + 6)$

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

$\frac{-x}{-1} = \frac{0}{-1}$ OR $x + 6 - 6 = 0 - 6$

$x = 0$ OR $x = -6$

$(0, 0)$ or $(-6, 0)$

$f(x) = y = -x^2 - 6x$

Find y-intercept let $x = 0$

$f(0) = -(0)^2 - 6(0)$

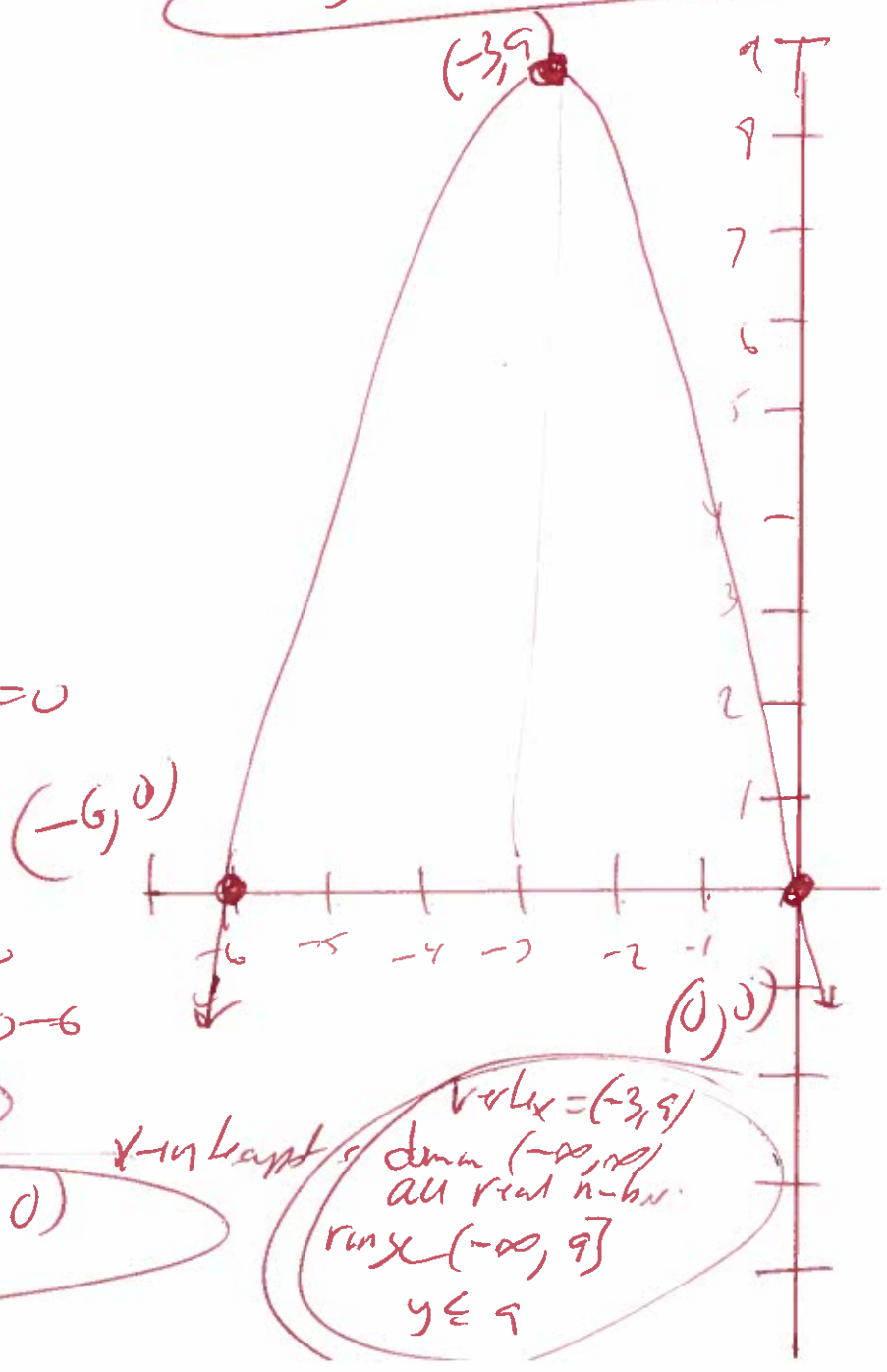
$f(0) = -(0)(0) - 6(0)$

$f(0) = -(0) - 6(0)$

$f(0) = 0 - 0$

$f(0) = 0$

$(0, 0)$ y-intercept



Vertex $= (-3, 9)$

domain $(-\infty, \infty)$ all real numbers

range $(-\infty, 9]$

$y \leq 9$

x-intercept

80. $f(x) = 4^x$

Graph

$f(-2) = 4^{-2}$

$f(-2) = \frac{1}{4^2}$

$f(-2) = \frac{1}{4 \cdot 4}$

$f(-2) = \frac{1}{16}$

$f(-1) = 4^{-1}$

$f(-1) = \frac{1}{4^1}$

$f(-1) = \frac{1}{4}$

$f(0) = 4^0$

$f(0) = 1$ 4 to zero power is 1

$f(1) = 4^1$

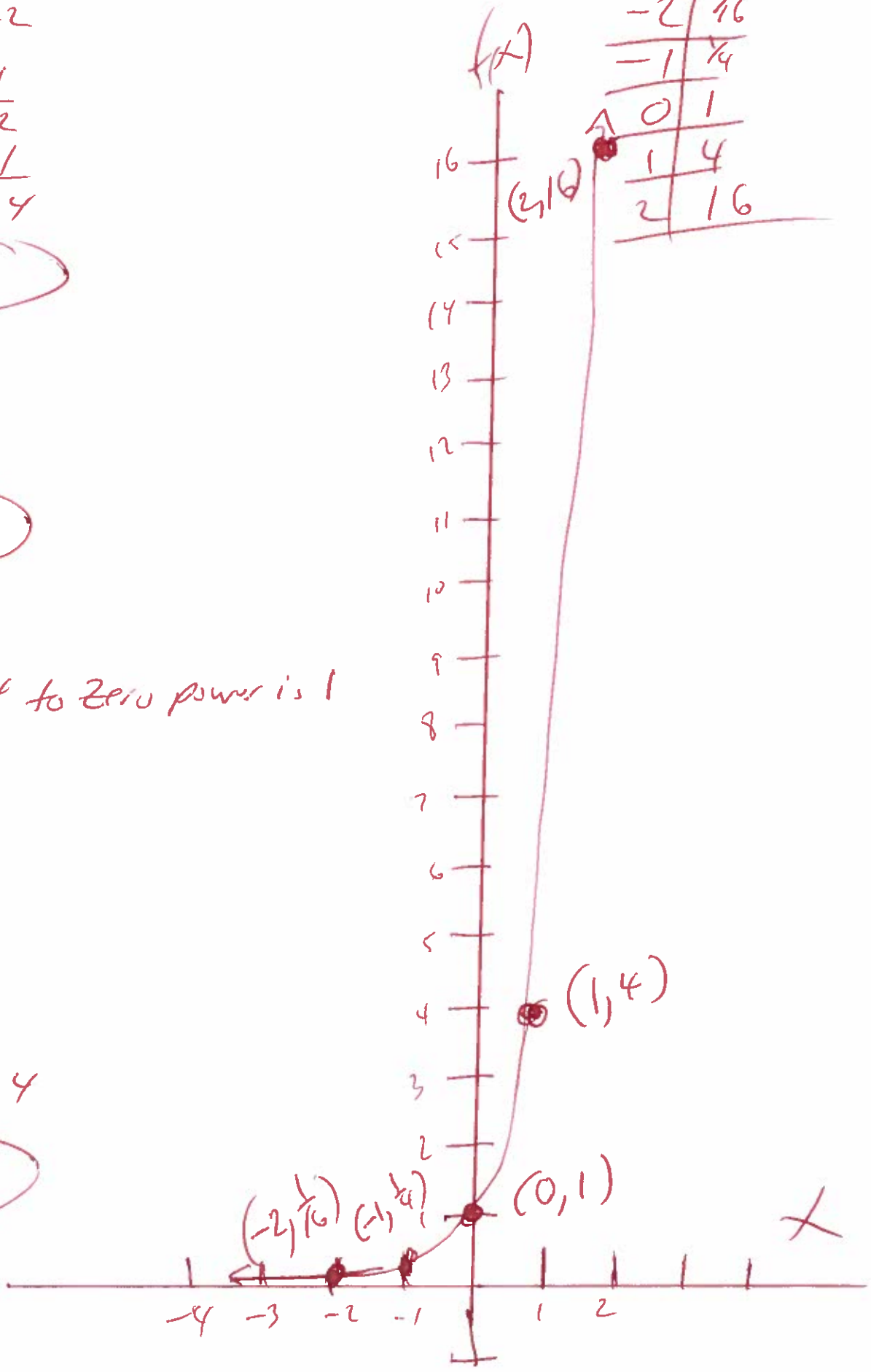
$f(1) = 4$

$f(2) = 4^2$

$f(2) = 4 \cdot 4$

$f(2) = 16$

x	f(x)
-2	1/16
-1	1/4
0	1
1	4
2	16



(81) $f(x) = \left(\frac{1}{2}\right)^x$

Graph

$f(-2) = \left(\frac{1}{2}\right)^{-2}$

$f(-2) = \left(2^{-1}\right)^{-2}$ rewrite

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

$f(-2) = 2^2$

$f(-2) = 2 \cdot 2$

$f(-2) = 4$

$f(-1) = \left(\frac{1}{2}\right)^{-1}$

$f(-1) = \left(2^{-1}\right)^{-1}$

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

$f(-1) = 2^1$

$f(-1) = 2$

$f(0) = \left(\frac{1}{2}\right)^0$

$f(0) = 1$ $\frac{1}{2}$ to zero power is 1

$f(1) = \left(\frac{1}{2}\right)^1$

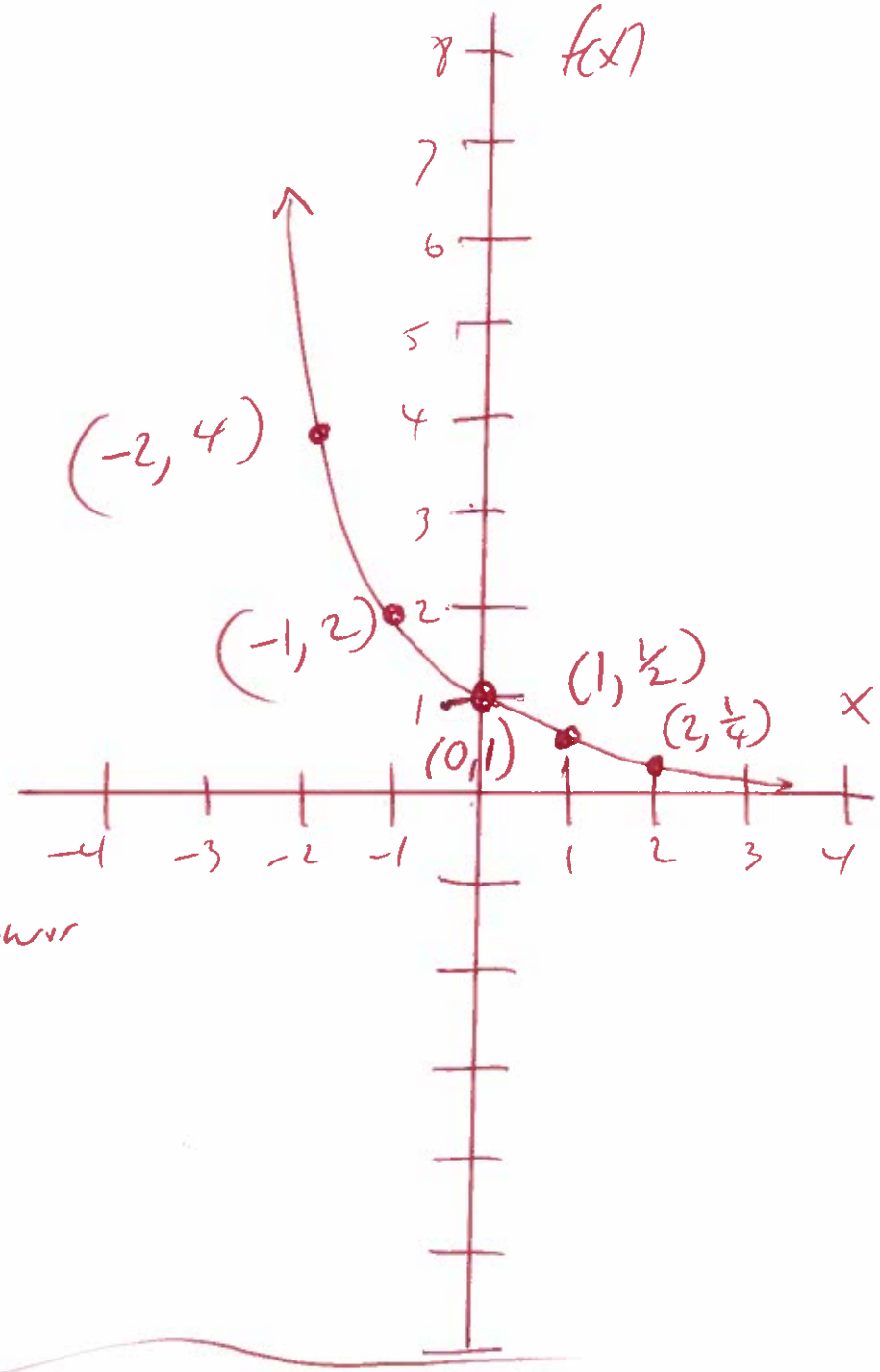
$f(1) = \frac{1}{2}$

$f(2) = \left(\frac{1}{2}\right)^2$

$f(2) = \left(\frac{1}{2}\right)\left(\frac{1}{2}\right)$

$f(2) = \frac{1}{4}$

x	f(x)
-2	4
-1	2
0	1
1	1/2
2	1/4



(82.) four bacteria are placed in a petri dish. the population will triple every day. The formula for the number of bacteria in the dish on day t is $N(t) = 4(3)^t$, where t is the number of days after the four bacteria are placed in the dish. How many bacteria are in the dish five days after the four bacteria are placed in the dish?

$$N(t) = 4(3)^t$$

$$N(5) = 4(3)^5$$

$$N(5) = 4(3)(3)(3)(3)(3)$$

$$N(5) = 4(243)$$

$$N(5) = 972$$

$$\begin{array}{r} {\scriptstyle 1\ 1} \\ 243 \\ \times \quad 4 \\ \hline 972 \end{array}$$

(83.) write the first five terms of the sequence whose general term is given

$a_n = 2n - 2$

$a_1 = 2(1) - 2 = 2 - 2 = 0$ ✓

$a_2 = 2(2) - 2 = 4 - 2 = 2$ ✓

$a_3 = 2(3) - 2 = 6 - 2 = 4$ ✓

$a_4 = 2(4) - 2 = 8 - 2 = 6$ ✓

$a_5 = 2(5) - 2 = 10 - 2 = 8$ ✓