M0320 Homework 53 step

11-10-17

1.

(1) $3x-4<9x+26$

$3x-4+4<9x+26+4$

$3x<9x+30$

$3x-9x<9x+30-9x$

$-6x<30$

$\frac{-6x}{-6}>\frac{30}{-6}$ divide by a negative and turn the alligator around

$x>-5$

$(-5,\infty)$

(2.) given $h(x)=6x^2-1$ find $h(-3)$, $h(0)$, $h(5)$

$h(-3)=6(-3)^2-1$

$h(-3)=6(-3)(-3)-1$

$h(-3)=6(9)-1$

$h(-3)=54-1$

$h(-3)=53$

$h(0)=6(0)^2-1$

$h(0)=6(0)(0)-1$

$h(0)=6(0)-1$

$h(0)=0-1$

$h(0)=-1$

$h(5)=6(5)^2-1$

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

$h(5)=6(25)-1$

$h(5)=150-1$

$h(5)=149$

3.

use synthetic division

$(8x^2+13x+9) \div (x+1)$

$$\frac{8x^2+13x+9}{x+1}$$

opp

$$\begin{array}{r|rrr} -1 & 8 & 13 & 9 \\ & & -8 & -5 \\ \hline & 8 & 5 & 4 \end{array}$$

4 rem

$$8x+5+\frac{4}{x+1}$$

OR

use long division

$$\frac{8x^2+13x+9}{x+1}$$

$$8x+5+\frac{4}{x+1}$$

$$\begin{array}{r} 8x+5 \\ x+1\overline{)\,8x^2+13x+9} \\ -(8x^2+8x) \\ \hline 5x+9 \\ -(5x+5) \\ \hline 4 \end{array}$$

4 rem

4. factor by grouping

$5x^2 - 15xy - 2x + 6y =$

$(5x^2 - 15xy) + (-2x + 6y) =$

$5x(x - 3y) - 2(x - 3y) =$

$(x - 3y)(5x - 2)$

5. factor

$-54x^5y^3 - 63x^8y^2 =$

$9x^5y^2(-6y^1 - 7x^3) =$

$9x^5y^2(-6y - 7x^3) =$

6. Factor

$64x^2 - 169y^2 =$

$(8x)^2 - (13y)^2 =$

$(8x+13y)(8x-13y) =$

formula $a^2-b^2=(a+b)(a-b)$

4.

7. Solve

$x^2+6x-27=0$

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

Possibly 27, 1 / 3, 9

Let $x-3=0$ or $x+9=0$

$x-3+3=0+3$ OR $x+9-9=0-9$

$x=3$ or $x=-9$

$\{3, -9\}$

8. Solve

$x^2 - 3x = 0$

$x(x-3) = 0$

Let $x = 0$ OR $x - 3 = 0$

$x - 3 + 3 = 0 + 3$

$x = 3$

$\{0, 3\}$

9. Solve

$x^2 - 2x = 24$

Possibly

24 1

12 2

6 4

3 8

$x^2 - 2x - 24 = 24 - 24$

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

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

Let $x + 4 = 0$ OR $x - 6 = 0$

$x + 4 - 4 = 0 - 4$ OR $x - 6 + 6 = 0 + 6$

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

$\{-4, 6\}$

10. Solve

$x^3 - 11x^2 + 10x = 0$

possible: 10, 1, 2.5

$x(x^2 - 11x + 10) = 0$

$x(x-1)(x-10) = 0$

6. $\{0, 1, 10\}$

Let $x = 0$ OR $x - 1 = 0$ OR $x - 10 = 0$

$x - 1 + 1 = 0 + 1$ OR $x - 10 + 10 = 0 + 10$

$x = 1$ OR $x = 10$

---

11. Solve

$36x^3 - x = 0$

formula $a^2 - b^2 = (a+b)(a-b)$

$x(36x^2 - 1) = 0$

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

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

$\{0, -\frac{1}{6}, \frac{1}{6}\}$

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

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

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

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

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

12. Solve $48x^3 - 12x^2 - 6x = 0$

Possible: 8.1, 2.4, 1.1 → {0, 1/2, -1/4}

$6x(8x^2 - 2x - 1) = 0$

$6x(2x - 1)(4x + 1) = 0$

Set $6x = 0$ OR $2x - 1 = 0$ OR $4x + 1 = 0$

$\frac{6x}{6} = \frac{0}{6}$ OR $2x = 1$ OR $4x = -1$

$x = 0$ OR $\frac{2x}{2} = \frac{1}{2}$ OR $\frac{4x}{4} = \frac{-1}{4}$

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

---

13. Solve $x^2 - 15 = -2x$

Possible: 15.1, 3.5 → {3, -5}

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

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

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

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

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

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

14. Solve

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

Possibly 3.1

16.1
28
44

$(3x + 8)(x - 2) = 0$

Let $3x + 8 = 0$ OR $x - 2 = 0$

$3x + 8 - 8 = 0 - 8$ OR $x - 2 + 2 = 0 + 2$

$3x = -8$ OR $x = 2$

$\frac{3x}{3} = \frac{-8}{3}$ OR

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

$\{-\frac{8}{3}, 2\}$

8.

15. Simplify

$$\frac{2}{16a - 14} =$$

$$\frac{2(1)}{2(8a - 7)} =$$

$$\frac{1}{8a - 7} =$$

16. Simplify

$$\frac{-5a+5b}{a-b} =$$

$$\frac{-5(a-b)}{(a-b)} =$$

$$-5 =$$

17. Given $f(x) = \frac{x+6}{2x-1}$ find $f(4)$, $f(0)$, $f(-1)$

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

$$f(4) = \frac{4+6}{8-1}$$

$$f(4) = \frac{10}{-7}$$

$$f(0) = \frac{(0)+6}{2(0)-1}$$

$$f(0) = \frac{0+6}{0-1}$$

$$f(0) = \frac{6}{-1}$$

$$f(0) = -6$$

$$f(-1) = \frac{(-1)+6}{2(-1)-1}$$

$$f(-1) = \frac{-1+6}{-2-1}$$

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

18. Simplify

$$\frac{x}{2x-4} \cdot \frac{x^2-2x}{2} =$$

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

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

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

10.

19. Simplify

formula $a^2-b^2=(a+b)(a-b)$

$$\frac{x^2-y^2}{x+y} \div \frac{x}{x^2+yx} =$$

$$\frac{x^2-y^2}{x+y} \cdot \frac{x^2+yx}{x} =$$

$$\frac{(x+y)(x-y)}{(x+y)} \cdot \frac{x(x+y)}{x} =$$

$$\frac{(x+y)(x-y)}{(x+y)} \cdot \frac{x(x+y)}{x} =$$

$$(x+y)(x-y) =$$

OR

$$x^2-xy+xy-y^2$$

$$x^2-y^2$$

20. Simplify

$$\frac{x^2+9x+14}{x-5} \div \frac{x^2-2x-8}{x-5} =$$

$$\frac{x^2+9x+14}{x-5} \cdot \frac{x-5}{x^2-2x-8} =$$

Possible: 2·7, 14·1, 8·1, 2·4

$$\frac{(x+2)(x+7)}{(x-5)} \cdot \frac{(x-5)}{(x+2)(x-4)} =$$

$$\frac{\cancel{(x+2)}(x+7)}{\cancel{(x-5)}} \cdot \frac{\cancel{(x-5)}}{\cancel{(x+2)}(x-4)} =$$

$$\frac{x+7}{x-4} =$$

21. $$\frac{5}{3+y} + \frac{y+1}{3+y} =$$

$$\frac{(5)+(y+1)}{3+y} =$$

$$\frac{5+y+1}{3+y} =$$

$$\frac{y+6}{3+y} =$$

22. $\frac{5x^2+6x}{x-2} - \frac{15x+2}{x-2} =$

(12)

$\frac{(5x^2+6x)-(15x+2)}{(x-2)} =$

$\frac{5x^2+6x-15x-2}{(x-2)} =$

(5.1) (2.1)

$\frac{5x^2-9x-2}{(x-2)} =$

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

$5x+1 =$

23. $\frac{5x-8}{x^2-8x-9} - \frac{4x+1}{x^2-8x-9} =$

$\frac{(5x-8)-(4x+1)}{x^2-8x-9} =$

$\frac{5x-8-4x-1}{x^2-8x-9} =$

$\frac{x-9}{x^2-8x-9} =$

$\frac{(x-9)}{(x+1)(x-9)} =$

$\frac{1(x-9)}{(x+1)(x-9)} =$

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

24. Graph

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

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

$f(0) = 0 + 2$

$f(0) = 2$

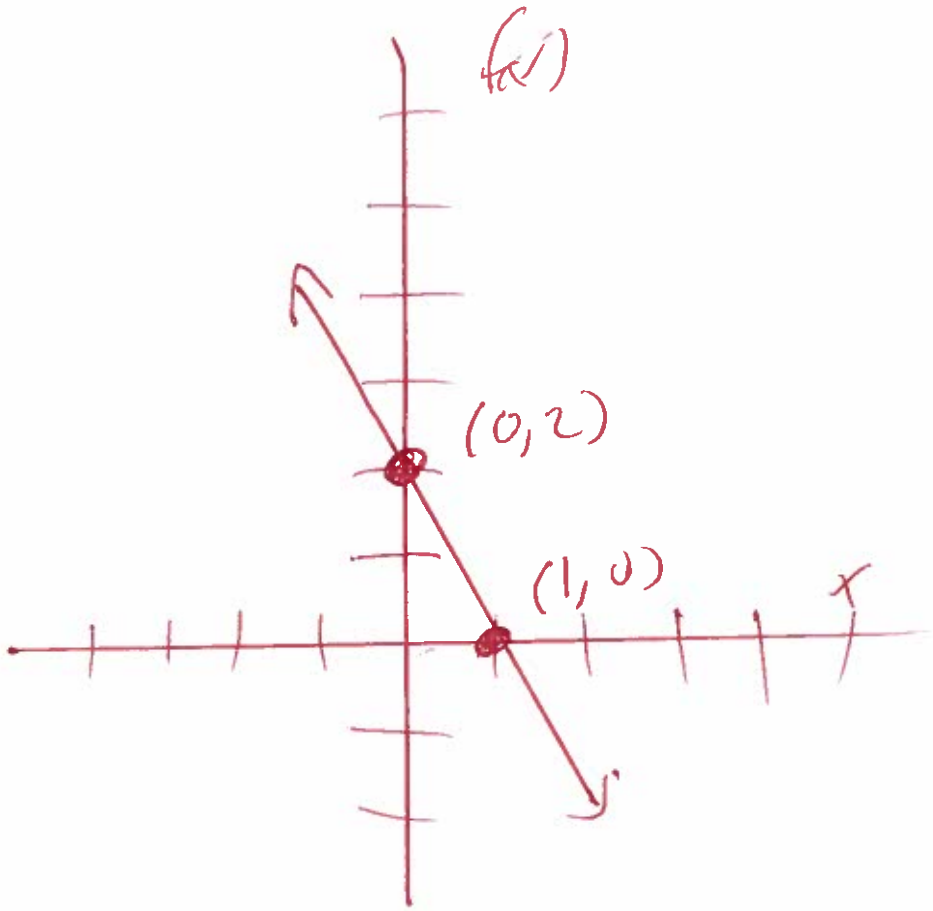
$f(1) = -2(1) + 2$

$f(1) = -2 + 2$

$f(1) = 0$

x	f(x)
0	2
1	0

13.



25. graph $y = x^2 - 4x + 5$ $x = 0, 1, 2, 3, 4$

x	y
0	5
1	2
2	1
3	2
4	5

(14)

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

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

$y = 0 - 0 + 5$

$y = 5$

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

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

$y = 1 - 4 + 5$

$y = -3 + 5$

$y = 2$

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

$y = (2)(2) - 4(2) + 5$

$y = 4 - 8 + 5$

$y = -4 + 5$

$y = 1$

$y = (3)^2 - 4(3) + 5$

$y = (3)(3) - 4(3) + 5$

$y = 9 - 12 + 5$

$y = -3 + 5$

$y = 2$

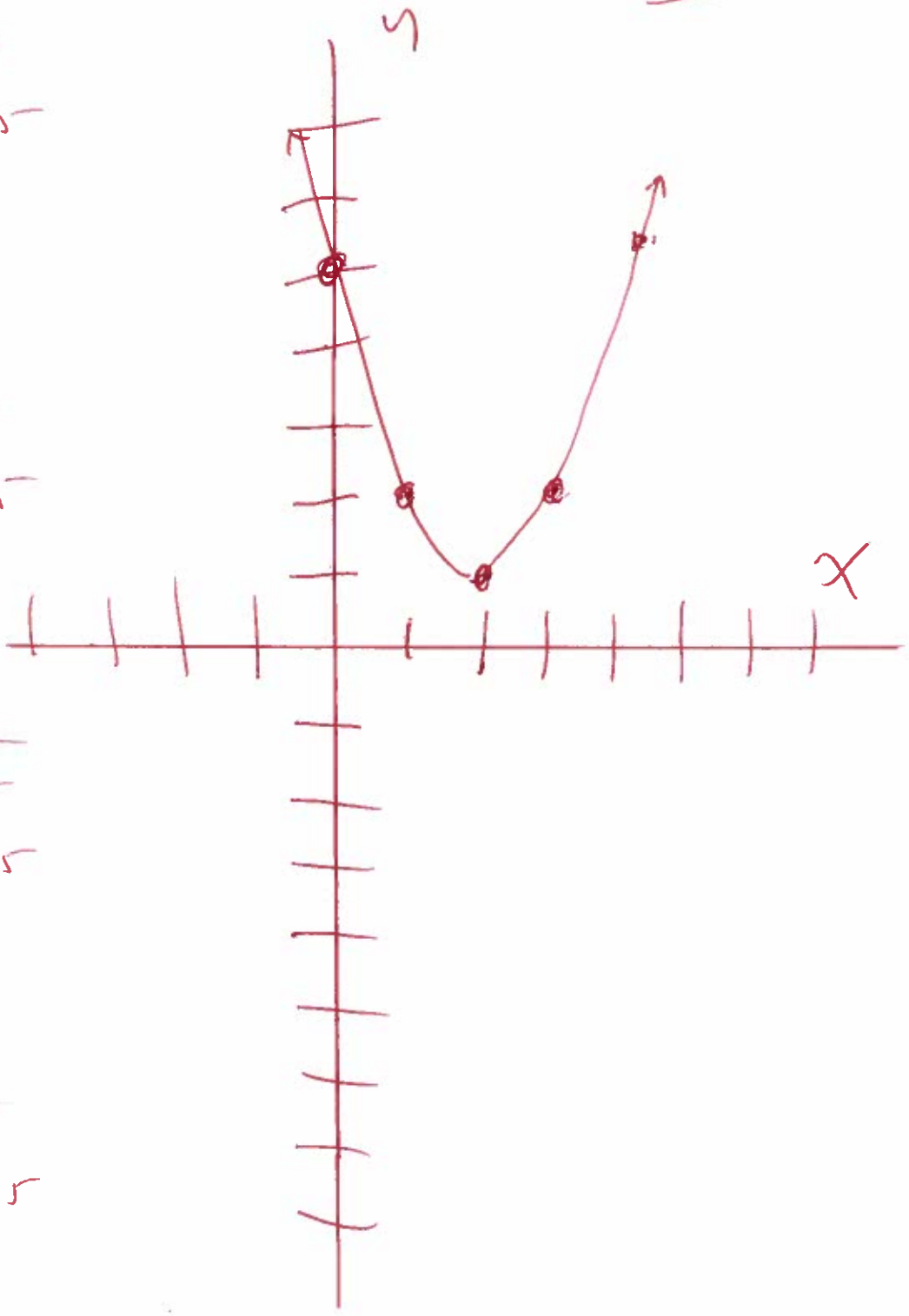
$y = (4)^2 - 4(4) + 5$

$y = (4)(4) - 4(4) + 5$

$y = 16 - 16 + 5$

$y = 0 + 5$

$y = 5$



26. $-3 \leq 2x - 13 \leq 13$

$-3 + 13 \leq 2x - 13 + 13 \leq 13 + 13$

$10 \leq 2x \leq 26$

$\frac{10}{2} \leq \frac{2x}{2} \leq \frac{26}{2}$

$5 \leq x \leq 13$

$[5, 13]$

27. $|2x - 3| = 5$

formula $|x| = a$

$x = -a$ or $x = a$

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

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

$2x = -2$ OR $2x = 8$

$\frac{2x}{2} = \frac{-2}{2}$ OR $\frac{2x}{2} = \frac{8}{2}$

$x = -1$ OR $x = 4$

$\{-1, 4\}$

28. $|x-2|<8$

Formula $|x|<a$
$-a<x<a$

$-8<x-2<8$

$-8+2<x-2+2<8+2$

$-6<x<10$

$(-6, 10)$

16

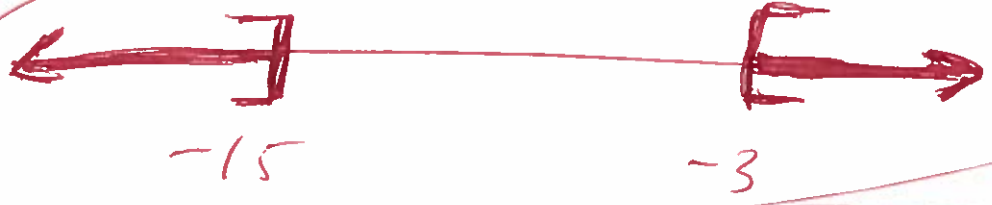
29. $|x+9| \geq 6$

Formula $|x| \geq a$
$x \leq -a$ or $x \geq a$

$x+9 \leq -6$ or $x+9 \geq 6$

$x+9-9 \leq -6-9$ or $x+9-9 \geq 6-9$

$x \leq -15$ or $x \geq -3$



$(-\infty, -15] \cup [-3, \infty)$

30. $\sqrt{64a^{10}b^{22}}$

Primes 2, 3, 5, 7, ...

$\sqrt{2^6a^{10}b^{22}} =$

$2^3a^5b^{11} =$ divide powers

$2 \cdot 2 \cdot 2\, a^5b^{11} =$

$8a^5b^{11} =$

2 | 64
2 | 32
2 | 16
2 | 8
2 | 4
2 | 2
1

31. $\sqrt[3]{-8x^9y^6} =$

Primes 2, 3, 5, 7, ...

$\sqrt[3]{(-2)^3x^9y^6} =$

$(-2)^1x^3y^2 =$ divide powers

$-2x^3y^2 =$

2 | 8
2 | 4
2 | 2
1

32. $f(x)=\sqrt{2x+3}$ find $f(2)$

$f(2)=\sqrt{2(2)+3}$

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

$f(2)=\sqrt{7}$

33. $243^{2/5}=$

Primes 2, 3, 5, 7 ...

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

$(3^5)^{2/5}=$

$(3^{\frac{5}{1}})^{\frac{2}{5}}=$

$3^{\frac{10}{5}}=$

$3^2=$

$3\cdot 3=$

$9=$

34. $\sqrt{24}$ Primes 2, 3, 5, 7...

$\sqrt{2^3 \cdot 3^1} =$

$\sqrt{2^2 \cdot 2^1 3^1} =$

$2^1\sqrt{2^1 3^1} =$ divide powers

$2\sqrt{6} =$

2 | 24
2 | 12
2 | 6
3 | 3
1

35. $\sqrt[3]{1250}$ Primes 2, 3, 5, 7, ...

$\sqrt[3]{5^4 \cdot 2} =$

$\sqrt[3]{5^3 \cdot 5^1 \cdot 2^1} =$

$5^1\sqrt[3]{5^1 2^1} =$

$5\sqrt[3]{10} =$

2 | 1250
5 | 625
5 | 125
5 | 25
5 | 5
1

(36) $\sqrt{81x^5}$ Primes 2, 3, 5, 7, ...

$\sqrt{3^4 x^5} =$

$\sqrt{3^4 x^4 x^1} =$

$3^2 x^2 \sqrt{x^1} =$

$3 \cdot 3 \cdot x^2 \sqrt{x^1} =$

$9x^2\sqrt{x} =$

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

(20)

(37) $\sqrt[3]{24x^9} =$ Primes 2, 3, 5, 7, ...

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

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

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

2 | 24
2 | 12
2 | 6
3 | 3
1

38. $\sqrt{121a^4b^3}$ = Primes 2, 3, 5, 7, 11

$\sqrt{11^2a^4b^3}$ =

$\sqrt{11^2a^4b^2b^1}$ =

$11^1a^2b^1\sqrt{b^1}$ =

$11a^2b\sqrt{b}$ =

11 | 121
11 | 11
1

21

39. $\sqrt[3]{81x^6y^4}$ = Primes 2, 3, 5, 7, ...

$\sqrt[3]{3^4x^6y^4}$ =

$\sqrt[3]{3^3 \cdot 3^1x^6y^3y^1}$

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

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

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

(40) Solve

$\sqrt{x-2} = 4$

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

$x-2 = 16$

$x-2+2 = 16+2$

$x = 18$

(41) $(2-5i)+(6+4i) =$

$2-5i+6+4i =$

$8-1i =$

$8-i =$

(42) $(8+6i)-(9-6i) =$

$8+6i-9+6i =$

$-1+12i =$

(43) $(3+5i)(4+i) =$

$12+3i+20i+5i^2 =$

$12+23i+5i^2 =$

$12+23i+5(-1) =$

$12+23i-5 =$

$7+23i =$

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

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

(23)

$\frac{25-5i-30i+6i^2}{25-5i+5i-i^2} =$

$\frac{25-35i+6i^2}{25-i^2} =$

$\frac{25-35i+6i^2}{25-(-1)} =$

$\frac{25-35i+6(-1)}{25-(-1)} =$

$\frac{25-35i-6}{25+1} =$

$\frac{19-35i}{26} =$

$\frac{19}{26} - \frac{35}{26}i$

45. $(x+4)^2 = 25$

$\sqrt{(x+4)^2} = \pm\sqrt{25}$

$x+4 = \pm 5$

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

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

$x = -9$ OR $x = 1$

46. Use Quadratic formula

$m^2 + 5m + 4 = 0$

$1m^2 + 5m + 4 = 0$

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

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

$$m = \frac{-(5) \pm \sqrt{(5)^2-4(1)(4)}}{2(1)}$$

$$m = \frac{-5 \pm \sqrt{25-16}}{2}$$

$$m = \frac{-5 \pm \sqrt{9}}{2}$$

$$m = \frac{-5 \pm 3}{2}$$

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

$m = -\frac{8}{2}$ OR $m = \frac{-2}{2}$

$m = -4$ OR $m = -1$

$\{-4, -1\}$

(47) Solve use Quadratic Formula

$-6y = 2y^2 - 8$

$0 = 2y^2 - 8 + 6y$

$0 = 2y^2 + 6y - 8$

$a = 2,\ b = 6,\ c = -8$

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

$$y = \frac{-(6) \pm \sqrt{(6)^2 - 4(2)(-8)}}{2(2)}$$

$$y = \frac{-6 \pm \sqrt{36 + 64}}{4}$$

$$y = \frac{-6 \pm \sqrt{100}}{4}$$

$$y = \frac{-6 \pm 10}{4}$$

$y = \frac{-6-10}{4}$ OR $y = \frac{-6+10}{4}$

$y = \frac{-16}{4}$ OR $y = \frac{4}{4}$

$y = -4$ OR $y = 1$

$\{-4, 1\}$

(48) use Quadratic formula

$x^2+12x+36=0$

$1x^2+12x+36=0$

$a=1,\ b=12,\ c=36$

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

$$x=\frac{-(12)\pm\sqrt{(12)^2-4(1)(36)}}{2(1)}$$

$$x=\frac{-12\pm\sqrt{144-144}}{2}$$

$$x=\frac{-12\pm\sqrt{0}}{2}$$

$$x=\frac{-12\pm0}{2}$$

$x=\frac{-12-0}{2}$ or $x=\frac{-12+0}{2}$

$x=\frac{-12}{2}$ or $x=\frac{-12}{2}$

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

$\{-6\}$

(26)

(49) Use Quadratic Formula

$x^2 - 5x - 1 = 0$

$1x^2 - 5x - 1 = 0$

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

(27)

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

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(-1)}}{2(1)}$$

$$x = \frac{5 \pm \sqrt{25 + 4}}{2}$$

$$x = \frac{5 \pm \sqrt{29}}{2}$$

$x = \frac{5 - \sqrt{29}}{2}$ or $x = \frac{5 + \sqrt{29}}{2}$

$\left\{ \frac{5 - \sqrt{29}}{2},\ \frac{5 + \sqrt{29}}{2} \right\}$

(50) Use Quadratic formula

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

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

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

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

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

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

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

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

$$x=-3\pm 2i$$

$x=-3-2i$ or $x=-3+2i$

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

(57) Graph

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

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

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

$f(-1) = 1 - 4$

$f(-1) = -3$

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

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

$f(0) = 0 - 4$

$f(0) = -4$

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

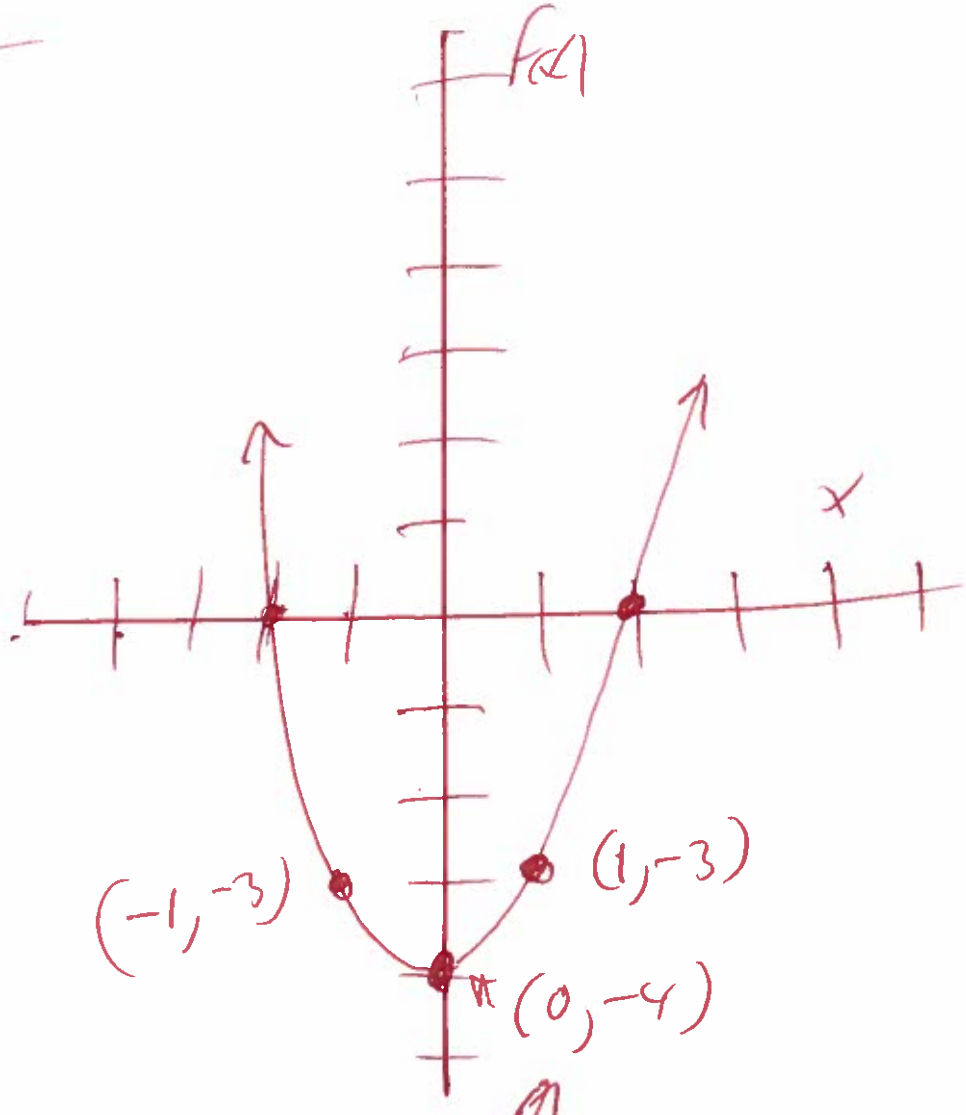
$f(1) = (1)(1) - 4$

$f(1) = 1 - 4$

$f(1) = -3$

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

(2)



Vertex

axis of symmetry

$x = 0$

(52) Find vertex

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

$a = -2,\ b = 8,\ c = -7$

30

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

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

$\text{Vertex} = \left(\frac{-8}{-4},\ f\left(\frac{-7}{-4}\right)\right)$

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

$\text{Vertex} = (2,\ -2(2)^2 + 8(2) - 7)$

$\text{Vertex} = (2,\ -2(2)(2) + 8(2) - 7)$

$\text{Vertex} = (2,\ -2(4) + 8(2) - 7)$

$\text{Vertex} = (2,\ -8 + 16 - 7)$

$\text{Vertex} = (2,\ 8 - 7)$

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

53. Find the total amount a college student has in a savings account if $12000 was invested and earned 5% compounded semiannually for 4 years.

31

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

$$A = 12000\left(1 + \frac{.05}{2}\right)^{2(4)}$$

$$A = 12000(1 + 0.025)^{8}$$

$$A = 12000(1.025)^{8}$$

$$A = 12000(1.218402898)$$

$$A = 14620.83477$$

Round

$$= 14620.83$$