Math 0320 S1 Step
8-30-18 due due due due

1. $2x < -8$

$\frac{2x}{2} < \frac{-8}{2}$

divide by a Positive do not turn the alligator around

$x < -4$

$(-\infty, -4)$

2. $-7x \leq 28$

$\frac{-7x}{-7} \geq \frac{28}{-7}$

divide by a negative and turn alligator around

$x \geq -4$

$[-4, \infty)$

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

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

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

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

$h(-5) = 150 - 5$

$h(-5) = 145$

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

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

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

$h(0) = 0 - 5$

$h(0) = -5$

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

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

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

$h(5) = 150 - 5$

$h(5) = 145$

(4) $x+y=6$
$3x+5y=20$

Is $(1,5)$ a solution?
$x \quad y$

$(1)+(5)=6$
$1+5=6$
$6=6$ ✓ Good ✓

$3(1)+5(5)=20$
$3+25=20$
$28 \neq 20$ No ✗

No $(1,5)$ is not a solution

Is $(5,1)$ a solution?
$x \quad y$

$x+y=6$
$3x+5y=20$

$(5)+(1)=6$
$5+1=6$
$6=6$ ✓ Good

$3(5)+5(1)=20$
$15+5=20$
$20=20$
Good ✓

YES $(5,1)$ is a solution.

5. $3x+4y=18$

$4x-4y=-4$

$7x+0=14$

$7x=14$

$\frac{7x}{7}=\frac{14}{7}$

$x=2$

Subst

$3x+4y=18$

$3(2)+4y=18$

$6+4y=18$

$6+4y-6=18-6$

$4y=12$

$\frac{4y}{4}=\frac{12}{4}$

$y=3$

$(x,y)=(2,3)$

(6) $x+2y=1$

$2x+5y=4$

$(x+2y=1)(-5)$

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

Mult
Flip the numbers

$-5x-10y=-5$

$4x+10y=8$

$-1x=3$

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

$x=-3$

Subst

$x+2y=1$

$(-3)+2y=1$

$-3+2y=1$

$-3+2y+3=1+3$

$2y=4$

$\frac{2y}{2}=\frac{4}{2}$

$y=2$

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

7. $(7x^2+13x+9) \div (x+1)$

$7x + 6 + \frac{3}{x+1}$

$x+1 \;\big|\; 7x^2+13x+9$

$-(7x^2+7x)$

$6x+9$

$-(6x+6)$

3 rem

Long division

$\frac{7x^2+13x+9}{x+1}$

$-1 \;\big|\; 7 \quad 13 \quad 9$

$\qquad\quad -7 \quad -6$

$7 \quad 6 \quad (3)$ rem

use Synthetic division

$7x+6+\frac{3}{x+1}$

8. $8x+16 =$ factor

$8(x+2) =$

9. $-27x^3y^4 - 18x^5y^3 =$ factor

$9x^3y^3(-3y - 2x^2) =$

10. $x^2 - 11x + 18 =$ factor

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

Possible
18 · 1
9 · 2
6 · 3

Ck
$(x-2)(x-9) =$
$x^2 - 9x - 2x + 18 =$
$x^2 - 11x + 18 =$ ✓ Good

11. $x^2 - 5x - 36 =$ factor

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

Possible
36 · 1
18 · 2
9 · 4
12 · 3

Ck
$(x+4)(x-9) =$
$x^2 - 9x + 4x - 36 =$
$x^2 - 5x - 36 =$ ✓ Good

12 $8t - 33 + t^2 =$ factor

33.1 Possible
11.3

$t^2 + 8t - 33 =$ rewrite

$(t - 3)(t + 11) =$

Ck

$(t - 3)(t + 11) =$

$t^2 + 11t - 3t - 33 =$

$t^2 + 8t - 33 =$ ✓ Good

13. $64x^2 - 169y^2 =$ factor

Formula
$a^2 - b^2$
$(a+b)(a-b)$

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

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

14. Solve $(7x+9)(8x-9)=0$

Let $7x+9=0$ OR $8x-9=0$

$7x+9-9=0-9$ OR $8x-9+9=0+9$

$7x=-9$ OR $8x=9$

$\frac{7x}{7}=\frac{-9}{7}$ OR $\frac{8x}{8}=\frac{9}{8}$

$x=\frac{-9}{7}$ OR $x=\frac{9}{8}$

15. Solve $x^2-13x+36=0$

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

Let $x-4=0$ OR $x-9=0$

$x-4+4=0+4$ OR $x-9+9=0+9$

$x=4$ OR $x=9$

Poss. b's

36, 1

18, 2

12, 3

4, 9

16. Solve $x^2 + 6x - 27 = 0$

Possible: 27.1, 9.3

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

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

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

$x=3$ OR $x=-9$

17. Solve $x^2 - 6x = 27$

Possible: 27.1, 3.9

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

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

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

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

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

$x=-3$ OR $x=9$

Solve

18 $(x-1)(x+12)=7x$

Possible
12.1
6.2
3.4

$x^2+12x-1x-12=7x$

$x^2+11x-12=7x$

$x^2+11x-12-7x=7x-7x$

$x^2+4x-12=0$

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

so $x-2=0$ or $x+6=0$

$x-2+2=0+2$ or $x+6-6=0-6$

$x=2$ or $x=-6$

Solve

19 $x^3-12x^2+20x=0$

Possible
20.1
10.2
4.5

$x(x^2-12x+20)=0$

$x(x-2)(x-10)=0$

so $x=0$ or $x-2=0$ or $x-10=0$

or $x-2+2=0+2$ or $x-10+10=0+10$

$x=2$ or $x=10$

(20) Solve $x^2 - 15 = -2x$

Possible: 15.1, 3.5

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

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

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

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

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

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

(21) Solve $7x^2 - 15x - 18 = 0$

Possible: 7.1, 18.1, 9.2, 3.6

$(7x + 6)(x - 3) = 0$

$7x + 6 = 0$ OR $x - 3 = 0$

$7x + 6 - 6 = 0 - 6$ OR $x - 3 + 3 = 0 + 3$

$7x = -6$ OR $x = 3$

$\frac{7x}{7} = \frac{-6}{7}$ OR

$x = \frac{-6}{7}$

Solve

22. $(x-1)(x+3)=12$

Possible
15.1
3.5

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

$x^2+2x-3=12$

$x^2+2x-3-12=12-12$

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

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

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

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

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

Solve

23. $x^2+14x+49=0$

Possible
49.1
7.7

$(x+7)(x+7)=0$

so $x+7=0$ or $x+7=0$

$x+7-7=0-7$ or $x+7-7=0-7$

$x=-7$ or $x=-7$

24. $\frac{-9a+9b}{a-b} =$

$\frac{-9(a-b)}{(a-b)} =$ factor

$-9 =$

25. $\frac{x}{2x-14} \cdot \frac{x^2-7x}{9} =$

$\frac{x}{2(x-7)} \cdot \frac{x(x-7)}{9} =$ factor

$\frac{x}{2(x-7)} \cdot \frac{x(x-7)}{9} =$

$\frac{x^2}{18} =$

26. $\frac{x^2+5x+6}{x-5} \div \frac{x^2+x-2}{x-5} =$

$\frac{x^2+5x+6}{x-5} \cdot \frac{x-5}{x^2+x-2} =$ rewrite

$\frac{(x+2)(x+3)}{(x-5)} \cdot \frac{(x-5)}{(x-1)(x+2)} =$ factor

$\frac{(\cancel{x+2})(x+3)}{(\cancel{x-5})} \cdot \frac{(\cancel{x-5})}{(x-1)(\cancel{x+2})} =$

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

27. $\frac{6}{7+y} + \frac{y+5}{7+y} =$

$\frac{(6)+(y+5)}{7+y} =$

$\frac{6+y+5}{7+y} =$

$\frac{y+11}{7+y} =$

28. $\frac{y-8}{3} = \frac{y}{7}$

$7(y-8) = 3(y)$ Cross Mult

$7y - 56 = 3y$

$7y - 56 + 56 = 3y + 56$

$7y = 3y + 56$

$7y - 3y = 3y + 56 - 3y$

$4y = 56$

$\frac{4y}{4} = \frac{56}{4}$

$y = 14$

29. $\frac{5}{2y-3} = -1$

$\frac{5}{2y-3} = \frac{-1}{1}$

$5(1) = -1(2y-3)$ Cross Mult

$5 = -2y + 3$

$5 - 3 = -2y + 3 - 3$

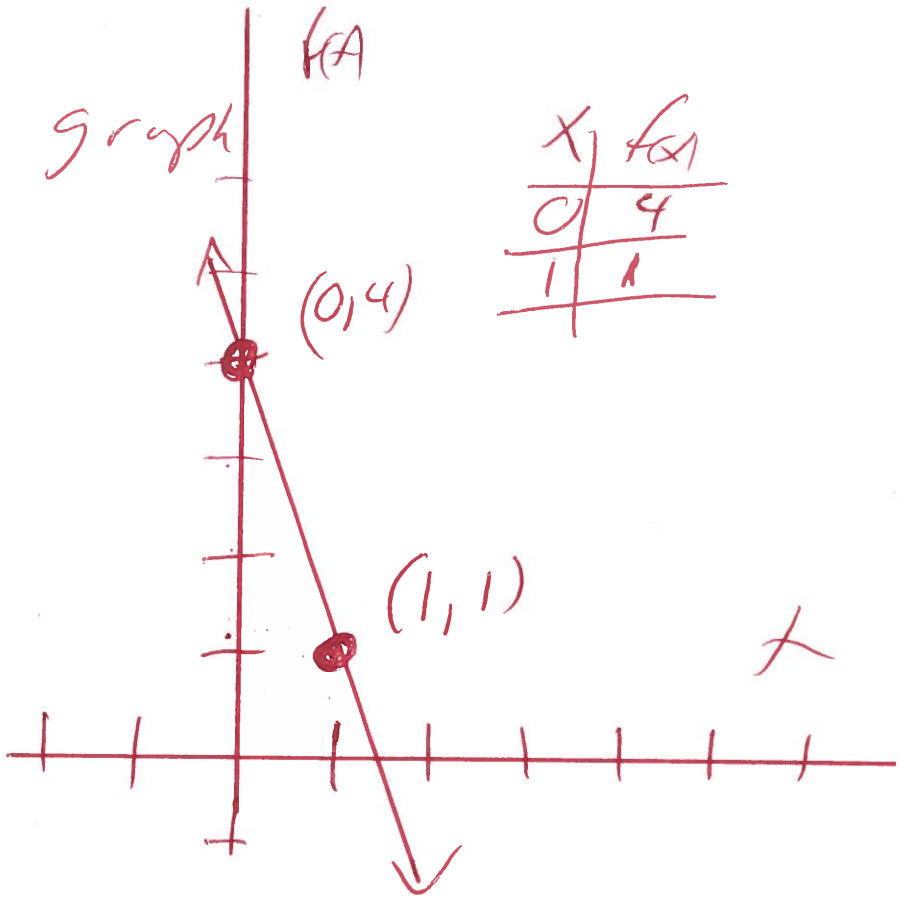
$2 = -2y$

$\frac{2}{-2} = \frac{-2y}{-2}$

$-1 = y$

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

graph



x	f(x)
0	4
1	1

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

$f(0) = 0 + 4$

$f(0) = 4$

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

$f(1) = -3 + 4$

$f(1) = 1$

31) $|2x - 1| = 3$

formula

$|x| = a$

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

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

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

$2x = -2$ OR $2x = 4$

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

$x = -1$ OR $x = 2$

(32) $|x-2| < 8$

formula
$|x| < a$
$-a < x < a$

$-8 < x-2 < 8$

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

$-6 < x < 10$

$(-6, 10)$

(33) $|x+7| \geq 9$

formula
$|x| > a$
$x < -a$ OR $x > a$

$x+7 \leq -9$ OR $x+7 \geq 9$

$x+7-7 \leq -9-7$ OR $x+7-7 \geq 9-7$

$x \leq -16$ OR $x \geq 2$

$(-\infty, -16] \cup [2, \infty)$

34 $\sqrt{36a^4b^{42}} =$

$\sqrt{6^2a^4b^{42}} =$

$6^{2/2}a^{4/2}b^{42/2} =$ divide powers

$6^1a^2b^{21} =$

$6a^2b^{21} =$

Primes 2, 3, 5, 7..

2 | 36
2 | 18
3 | 9
3 | 3
1

OR $36 = 6 \cdot 6 = 6^2 =$

Domain $[4, \infty)$

35. $f(x) = \sqrt{x-4}$

$f(4) = \sqrt{4-4}$

$f(4) = \sqrt{0}$

$f(4) = 0$

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

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

$f(5) = 1$

$f(8) = \sqrt{8-4}$

$f(8) = \sqrt{4}$

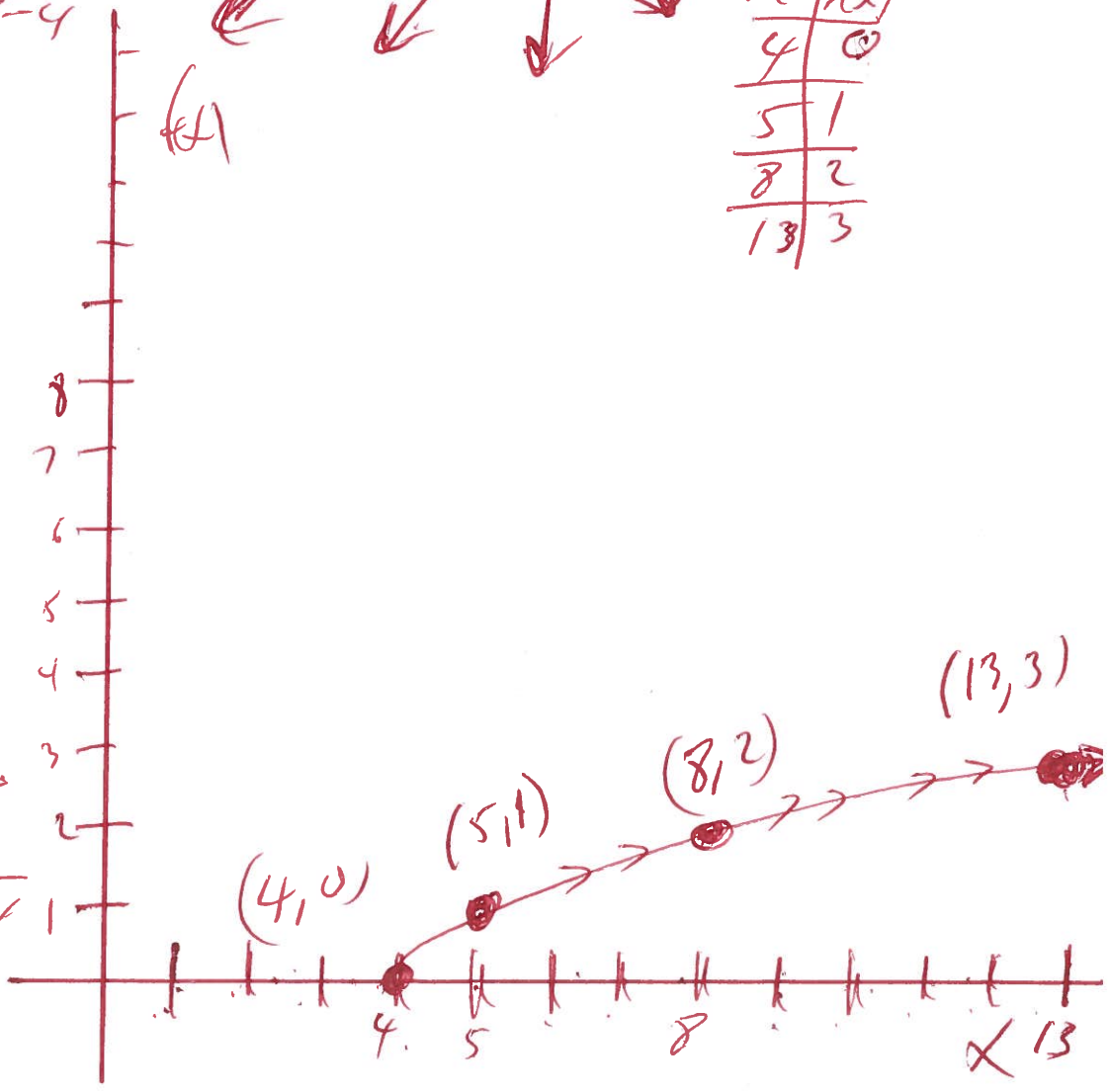
$f(8) = 2$

$f(13) = \sqrt{13-4}$

$f(13) = \sqrt{9}$

$f(13) = 3$

x	f(x)
4	0
5	1
8	2
13	3



36

$81^{\frac{5}{4}} =$

$\left(3^4\right)^{\frac{5}{4}} =$

$\left(3^{\frac{4}{1}}\right)^{\frac{5}{4}} =$

$\left(\frac{4}{1}\right)\left(\frac{5}{4}\right) =$ Mult powers

$3^{\frac{20}{4}}$

$3^5 =$

$3^5 =$

$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 =$

$243 =$

Prime 2, 3, 5, 7

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

37.

$\sqrt{54} =$

$\sqrt{9 \cdot 6} =$

$\sqrt{9}\sqrt{6} =$

$3\sqrt{6} =$

Prime 2, 3, 5, 7

2 | 54
3 | 27
3 | 9
3 | 3
1

38. $\sqrt{81x^9}$

Prime 2, 3, 5, 7

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

$\sqrt{3^4 \cdot x^9} =$

$\sqrt{3^4 x^8 x^1} =$

$3^{4/2} x^{8/2} \sqrt{x^1} =$

$3^2 x^4 \sqrt{x^1} =$

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

$9x^4\sqrt{x} =$

39. $\sqrt{81a^4b^7} =$

Prime 2, 3, 5, 7

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

$\sqrt{3^4 a^4 b^7} =$

$\sqrt{3^4 a^4 b^6 b^1} =$

$3^{4/2} a^{4/2} b^{6/2} \sqrt{b^1} =$

$3^2 a^2 b^3 \sqrt{b^1} =$

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

$9a^2b^3\sqrt{b} =$

(40) $\sqrt{x-14} = 2$

$(\sqrt{x-14})^2 = (2)^2$

$x - 14 = 4$

$x - 14 + 14 = 4 + 14$

$x = 18$

Ck

$\sqrt{x-14} = 2$

$\sqrt{18-14} = 2$

$\sqrt{4} = 2$

$2 = 2$ ✓ Good

(41) $\sqrt{x+2} = \sqrt{2x-3}$

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

$x + 2 = 2x - 3$

$x + 2 - x = 2x - 3 - x$

$x = 2x - 5$

$1x - 2x = 2x - 5 - 2x$

$-1x = -5$

$\frac{-1x}{-1} = \frac{-5}{-1}$

$x = 5$

Ck

$\sqrt{x+2} = \sqrt{2x-3}$

$\sqrt{5+2} = \sqrt{2(5)-3}$

$\sqrt{7} = \sqrt{10-3}$

$\sqrt{7} = \sqrt{7}$ ✓

Good

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

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

$17-1i=$

$17-i=$

43) $(3+5i)-(6-5i)=$

$3+5i-6+5i=$

$-3+10i=$

44) $(8+7i)(4+i)=$

$32+8i+28i+7i^2=$

$32+36i+7i^2=$

$32+36i+7(-1)=$

$32+36i-7=$

$25+36i=$

formula

$i^2=-1$

45.

$$\frac{3-2i}{3+i} =$$

$$\left(\frac{3-2i}{3+i}\right)\left(\frac{3-i}{3-i}\right)$$

$$\frac{9-3i-6i+2i^2}{9-3i+3i-i^2} =$$

$$\frac{9-9i+2i^2}{9-i^2} =$$

$$\frac{9-9i+2(-1)}{9-(-1)} =$$

$$\frac{9-9i-2}{9+1} =$$

$$\frac{7-9i}{10} =$$

$$\frac{7}{10} - \frac{9i}{10} =$$

formula

$i^2 = -1$

(46) $(x+7)^2 = 9$ Solve

$\sqrt{(x+7)^2} = \pm\sqrt{9}$

$x+7 = \pm 3$

$x+7 = -3$ or $x+7 = 3$

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

$x = -10$ or $x = -4$

Ck

$(x+7)^2 = 9$

$(-10+7)^2 = 9$

$(-3)^2 = 9$

$(-3)(-3) = 9$

$9 = 9$ ✓ Good

$(x+7)^2 = 9$

$(-4+7)^2 = 9$

$(3)^2 = 9$

$(3)(3) = 9$

$9 = 9$ ✓ Good

(47) $x^2+14x=-33$ Solve Complete the Square

$x^2+14x+\left(\frac{1}{2}(14)\right)^2=-33+\left(\frac{1}{2}(14)\right)^2$ add to both sides

$x^2+14x+(7)^2=-33+(7)^2$

$x^2+14x+49=-33+49$

$x^2+14x+49=16$

$(x+7)(x+7)=16$

$(x+7)^2=16$

$\sqrt{(x+7)^2}=\pm\sqrt{16}$

$x+7=\pm 4$

$x+7=-4$ or $x+7=4$

$x+7-7=-4-7$ or $x+7-7=4-7$

$x=-11$ or $x=-3$

(48) Solve

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

$(m+1)(m+4)=0$

Let $m+1=0$ or $m+4=0$

$m+1-1=0-1$ or $m+4-4=0-4$

$m=-1$ or $m=-4$

~~Or use Quad form~~

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

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

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

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

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

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

$$m=\frac{-5\pm3}{2}$$

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

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

$m=-1$ or $m=-4$

(45) $2y = 3y^2 - 1$

Solve

$2y - 2y = 3y^2 - 1 - 2y$

$0 = 3y^2 - 2y - 1$

$0 = (3y+1)(y-1)$

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

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

$3y = -1$ or $y = 1$

$\frac{3y}{3} = \frac{-1}{3}$

$y = -\frac{1}{3}$

or use Quad formula

$3y^2 - 2y - 1 = 0$

$a=3,\ b=-2,\ c=-1$

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

$y = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-1)}}{2(3)}$

$y = \frac{2 \pm \sqrt{4+12}}{6}$

$y = \frac{2 \pm \sqrt{16}}{6}$

$y = \frac{2 \pm 4}{6}$

$y = \frac{2-4}{6}$ or $y = \frac{2+4}{6}$

$y = \frac{-2}{6}$ or $y = \frac{6}{6}$

$y = \frac{2(-1)}{2(3)}$ or $y = \frac{6}{6}$

$y = -\frac{1}{3}$ or $y = 1$

50. $1x^2+4x+29=0$

Solve

$a=1, b=4, c=29$

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

$$x=\frac{-(4)\pm\sqrt{(4)^2-4(1)(29)}}{2(1)}$$

$$x=\frac{-4\pm\sqrt{16-116}}{2}$$

$$x=\frac{-4\pm\sqrt{-100}}{2}$$

$$x=\frac{-4\pm10i}{2}$$

$$x=-2\pm5i$$

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

51. $f(x) = 4x^2 + 8x - 2$ find Vertex

$a = 4, \quad b = 8, \quad c = -2$

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

$\text{Vertex} = \left(\frac{-(8)}{2(4)}, f\left(\frac{-(8)}{2(4)}\right)\right)$

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

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

$\text{Vertex} = (-1, 4(-1)^2 + 8(-1) - 2)$

$\text{Vertex} = (-1, 4(-1)(-1) + 8(-1) - 2)$

$\text{Vertex} = (-1, 4(1) + 8(-1) - 2)$

$\text{Vertex} = (-1, 4 - 8 - 2)$

$\text{Vertex} = (-1, -4 - 2)$

$\text{Vertex} = (-1, -6)$

(max)
(min)