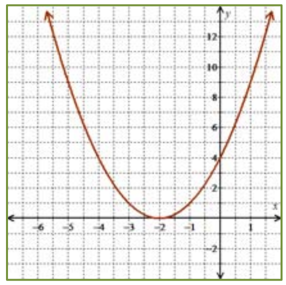
1. a. The vertex is $(-2,0)$.

   b. The y-intercept is $(0,4)$

   c. The x-intercept is $(-2,0)$.



2. $$z(2z+1)=666$$
$$2z^2+z-666=0$$

$$z=\frac{-1\pm\sqrt{1^2-4(2)(-666)}}{2(2)}$$
$$z=\frac{-1\pm\sqrt{5329}}{4}$$
$$z=\frac{-1\pm 75}{4}$$

Since length can't be negative,
$$z=\frac{-1+75}{4}=18$$

3. $4x^2+81y^2$ is prime.

4. $4x^2-81y^2=(2x+9y)(2x-9y)$

5. $$y=0$$
$$3+5x^2=0$$
$$x^2=-\frac{3}{5}$$

Well that's not going to happen in real-number-ville, so the parabola must not have any x-intercepts.

6. $-7x^{-2}=-\dfrac{7}{x^2}$

7. $$-7^{-2}=-\frac{1}{7^2}$$
$$=-\frac{1}{49}$$

8. $$(x-2)(x+7)=36$$
$$x^2+5x-14=36$$
$$x^2+5x-50=0$$
$$(x+10)(x-5)=0$$

$x+10=0$ or $x-5=0$

$x=-10$ or $x=5$

The solutions are -10 and 5.

9. a. The domain is $(-2,\infty)$ b. The range is $[1,\infty)$ c. $g(2)=2$

   d. $g(x)=3$ when x is (about) 0 and (about) 6. There are actually two solutions close to 0.

11. $$2x^3y^2+5x^2yz-3xz^2=x\left(2x^2y^2+5xyz-3z^2\right)$$
$$=x\left[2x^2y^2+6xyz-xyz-3z^2\right]$$
$$=x\left[2xy(xy+3z)-z(xy+3z)\right]$$
$$=x(2xy-z)(xy+3z)$$

12. $1-64x^{15}=\left(1-4x^5\right)\left(1+4x^5+16x^{10}\right)$

13.
$$\begin{aligned} 30-11m-2m^2 &= 30-15m+4m-2m^2 \\ &= 15(2-m)+2m(2-m) \\ &= (2-m)(15+2m) \end{aligned}$$

14.
$$\begin{aligned} u^2+40^2 &= (4u+5)^2 \\ u^2+1600 &= 16u^2+40u+25 \\ 0 &= 15u^2+40u-1575 \\ \frac{1}{5}(0) &= \frac{1}{5}\left(15u^2+40u-1575\right) \\ 0 &= 3u^2+8u-315 \end{aligned}$$

$$u=\frac{-8\pm\sqrt{8^2-4(3)(-315)}}{2(3)}$$

$$u=\frac{-8\pm\sqrt{3844}}{6}$$

$$u=\frac{-8\pm 62}{6}$$

Since length cannot be negative, $u=\dfrac{-8+62}{6}=9$.

15. a. $h(0)=192$ and $h(2)=256$

The projectile was fired from a height of 192 ft and after 2 seconds it was at a height of 256 ft.

b.
$$\begin{aligned} h(t) &= 0 \\ -16t^2+64t+192 &= 0 \\ -\frac{1}{16}\left(-16t^2+64t+192\right) &= -\frac{1}{16}(0) \\ t^2-4t-12 &= 0 \\ (t-6)(t+2) &= 0 \end{aligned}$$

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

$t=6$ or $t=-2$

Since the projectile surely did not hit the ground before it was launched, it must have taken the projectile 6 seconds to return to the ground.

c. When graphing the height function, the vertex occurs when $t=-\dfrac{b}{2a}=2$. We already saw that the height of the projectile was 256 ft at that time, so the maximum height reached by the projectile was 256 ft.

16. Let x represent the number of dollars invested by Erma and y represent the number of dollars invested by Trudy. The resultant system is $\begin{cases} y = x + 5000 \\ .07x = .05y \end{cases}$.

Substituting $x + 5000$ for y in the second equation we have:

$$\begin{aligned} .07x &= .05(x + 5000) \\ .07x &= .05x + 250 \\ .02x &= 250 \\ x &= 12500 \end{aligned}$$

So Erma invested \$12,500 and Trudy invested \$17,500.

17. a. The vertex is $(-3, 21)$. b. The y-intercept is $(0, 3)$.

c.

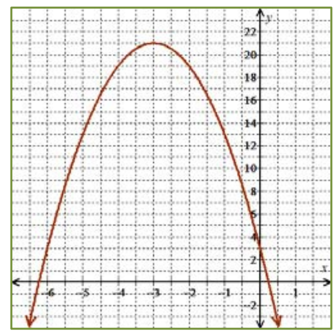
$$\begin{aligned} y &= 0 \\ -2x^2 - 12x + 3 &= 0 \\ 2x^2 + 12x - 3 &= 0 \end{aligned}$$

$$x = \frac{-12 \pm \sqrt{12^2 - 4(2)(-3)}}{2(2)}$$

$$x = \frac{-12 \pm \sqrt{168}}{4}$$

$$x = \frac{-12 \pm 2\sqrt{42}}{4}$$

$$x = \frac{-6 \pm \sqrt{42}}{2}$$



The x-intercepts are $\left(\frac{-6 + \sqrt{42}}{2}, 0\right)$ and $\left(\frac{-6 - \sqrt{42}}{3}, 0\right)$.

18. a. The domain is $(-\infty, 1]$. b. The range is $[-1, \infty)$. c. $f(2)$ is not defined. d. $f(-6) = 6$

19. $x = 8$

20. $b = 17$

21. $t = -28$

22. $f(-8) = -(-8)^2$
$= -64$

23.

$$t = \frac{-22 \pm \sqrt{22^2 - 4(3)(-45)}}{2(3)}$$

$$t = \frac{-22 \pm \sqrt{1024}}{6}$$

$$t = \frac{-22 \pm 32}{6}$$

$t = \frac{-22 + 32}{6}$ <u>or</u> $t = \frac{-22 - 32}{6}$

$t = \frac{5}{3}$ <u>or</u> $t = -9$

The solutions are $\frac{5}{3}$ and -9.

24.

$$x^2+(x-7)^2=97^2$$
$$x^2+x^2-14x+49=9409$$
$$2x^2-14x-9360=0$$
$$\frac{1}{2}\left(2x^2-14x-9360\right)=\frac{1}{2}(0)$$
$$x^2-7x-4680=0$$

$$x=\frac{-(-7)\pm\sqrt{(-7)^2-4(1)(-4680)}}{2(1)}$$
$$x=\frac{7\pm\sqrt{18769}}{2}$$
$$x=\frac{7\pm 137}{2}$$

Since length can't be negative, $x=\frac{7+137}{2}=72$

25.

$$2c+2(3c-4)=144$$
$$2c+6c-8=144$$
$$8c=152$$
$$c=19$$

26.

$$y^2-4=7y-4$$
$$y^2-7y=0$$
$$y(y-7)=0$$

$y=0$ <u>or</u> $y-7=0$

$y=0$ <u>or</u> $y=7$

The solutions are 0 and 7.

27. $8+125x^6=\left(2+5x^2\right)\left(4-10x^2+25x^4\right)$

28. $2x^2+5x-10$ is prime.

29. There you go again … sum of squares does not factor. x^2+9 is prime!

30.

$$-5y^2z^4+20y^2=-5y^2\left(z^2-4y^2\right)$$
$$=-5y^2(z+2y)(z-2y)$$

31.

$$(2x+8)^2=96$$
$$2x+8=\pm\sqrt{96}$$
$$2x+8=\pm\sqrt{16\cdot 6}$$
$$2x+8=\equiv 4\sqrt{6}$$
$$2x=-8\pm 4\sqrt{6}$$
$$x=\frac{-8\pm 4\sqrt{6}}{2}$$
$$x=-4\pm 2\sqrt{6}$$

The solutions are:

$-4+2\sqrt{6}$ and $-4-2\sqrt{6}$.

32. a. $\begin{cases} 2x-4y=-2 \\ 3x+10y=11 \end{cases} \Rightarrow \begin{cases} 5(2x-4y)=5(-2) \\ 2(3x+10y)=2(11) \end{cases} \Rightarrow \begin{cases} 10x-20y=-10 \\ 6x+20y=22 \end{cases}$

$$\begin{aligned} 16x &= 12 \\ x &= \frac{3}{4} \end{aligned}$$

Backsubstituting into $2x-4y=-2$ we have:

$$\begin{aligned} 2\left(\frac{3}{4}\right)-4y &= -2 \\ -4y &= -\frac{7}{2} \\ y &= \frac{7}{8} \end{aligned}$$

The solution is $\left(\frac{3}{4},\frac{7}{8}\right)$.

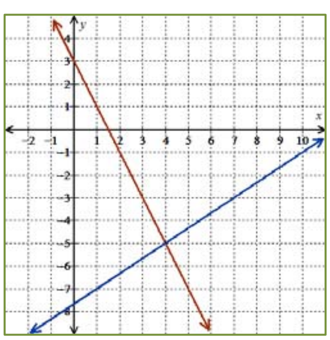
b. $\begin{cases} y=-\frac{2}{3}x+4 \\ 4x+6y=24 \end{cases}$

Substituting $-\frac{2}{3}x+4$ for y in the second equation we have:

$$\begin{aligned} 4x+6\left(-\frac{2}{3}x+4\right) &= 24 \\ 4x-4x+24 &= 24 \\ 0 &= 0 \end{aligned}$$

Darn right, zero equals zero! The two equations represent the same line and, consequently each and every point on that common line is a solution to the system of equations.

c. $\begin{cases} y=-2x+3 \\ 2x-3y=23 \end{cases}$



The solution is $(4,-5)$.