For each of the following, find the roots of the quadratic (if they are real). Then put the function into standard form. If there are two real roots, graph WITHOUT a table of values. If there are 1 or 0 real roots, graph WITH a table of values. All of the following must be listed in your work:

- Function in Standard Form
- Vertex
- Axis of Symmetry
- Y-intercept (exact)
- X-intercept (exact if possible, otherwise read off the graph)

1. $f(x) = (x+3)(x-1)$

Roots:

$x+3$ or $x-1$

$x=-3$ $\quad x=1$

Roots: $(-3,0)$ and $(1,0)$

Standard form:

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

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

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

$A=1, B=2, C=-3$

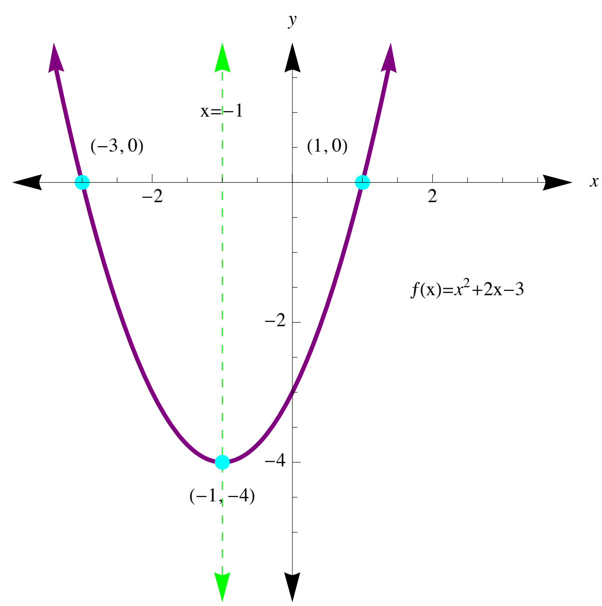
Vertex: $x = \frac{-B}{2A} = \frac{-(2)}{2(1)} = \frac{-2}{2} = -1$

$f(-1) = (-1)^2 + 2(-1) - 3 = -4$

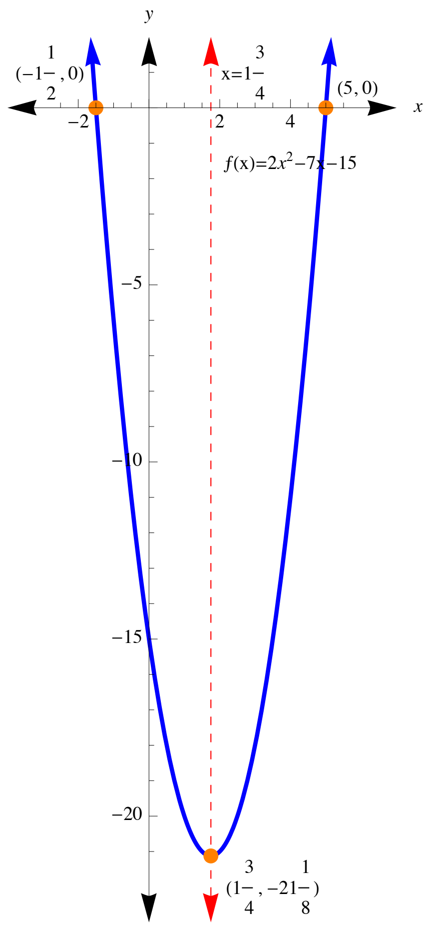
Vertex: $(-1,-4)$

Axis of symmetry: $x=-1$

$y-\text{int}: (0,-3)$



2. $f(x)=(2x+3)(x-5)$



Roots:

$2x+3=0 \quad or \quad x-5=0$

$2x=-3 \qquad x=5$

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

Standard form:

$f(x)=(2x+3)(x-5)$

$f(x)=2x^2-10x+3x-15$

$f(x)=2x^2-7x-15$

$A=2, B=-7, C=-15$

Vertex: $x=\frac{-B}{2A}=\frac{-(-7)}{2(2)}=\frac{7}{4}=1\frac{3}{4}$

$f\left(\frac{7}{4}\right)=2\left(\frac{7}{4}\right)^2-7\left(\frac{7}{4}\right)-15$

Work with fractions:

$\left(\frac{7}{4}\right)^2=\left(\frac{7}{4}\right)\left(\frac{7}{4}\right)=\frac{49}{16}$

$2\left(\frac{49}{16}\right)=\left(\frac{2}{1}\right)\left(\frac{49}{16}\right)=\frac{98}{16}=\frac{49}{8}$

$-7\left(\frac{7}{4}\right)=\left(-\frac{7}{1}\right)\left(\frac{7}{4}\right)=-\frac{49}{4}$

$f\left(\frac{7}{4}\right)=\frac{49}{8}-\frac{49}{4}-15$

$\frac{49}{8}-\frac{49}{4}=\frac{(49)(4)-(8)(49)}{(8)(4)}=\frac{196-392}{32}=\frac{-196}{32}=-\frac{49}{8}$

$-\frac{49}{8}-15=-\frac{49}{8}-\frac{15}{1}=-\frac{(49)(1)+(8)(15)}{(8)(1)}=-\frac{49+120}{8}=-\frac{169}{8}=-21\frac{1}{4}$

$f\left(\frac{7}{4}\right)=-21\frac{1}{4}$

Vertex: $\left(1\frac{3}{4}, -21\frac{1}{8}\right)$

Roots: $\left(-1\frac{1}{2}, 0\right)$ and $(5, 0)$

Axis of symmetry: $x=1\frac{3}{4}$

$y-$int: $(0, -15)$

3. $f(x)=(x-4)(-x+7)$

Roots:

$$\begin{array}{lcl} x-4=0 & \text{or} & -x+7=0 \\ x=4 & & -x=-7 \\ & & x=7 \end{array}$$

Roots: $(4,0)$ and $(7,0)$

Standard form:

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

$f(x)=-x^2+7x+4x-28$

$f(x)=-x^2+11x-28$

$A=-1, B=11, C=-28$

Vertex: $x=\frac{-B}{2A}=\frac{-(11)}{2(-1)}=\frac{-11}{-2}=5.5$

$f(5.5)=-(5.5)^2+11(5.5)-28$

Work with decimals:

$-(5.5)^2$:

$$\begin{array}{r} 5.5 \\ \times\ 5.5 \\ \hline 275 \\ +\ 2750 \\ \hline 3025 \end{array}$$

$-(5.5)^2=-30.25$

$11(5.5)$:

$$\begin{array}{r} 11 \\ \times\ 5.5 \\ \hline 55 \\ +\ 550 \\ \hline 605 \end{array}$$

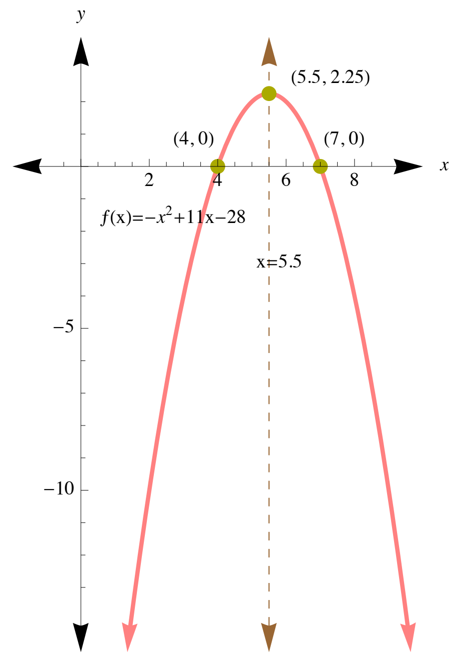
$11(5.5)=60.5$

$f(5.5)=-30.25+60.5-28$

$60.5-30.25$:

$$\begin{array}{r} 6\,0.\,\overset{4}{\not 5}\,\overset{10}{\not 0} \\ -\ 3\,0.\,2\,5 \\ \hline 3\,0.\,2\,5 \end{array}$$

$-30.2560.5=30.25$



$30.25-28$:

$$\begin{array}{r} \overset{2}{\not 3}\,\overset{10}{\not 0}.\,2\,5 \\ -\ 2\,8.\,0\,0 \\ \hline 2.\,2\,5 \end{array}$$

$30.25-28=2.25$

$f(5.5)=2.25$

Vertex: $(5.5, 2.25)$

Axis of symmetry: $x=5.5$

y-int: $(0,-28)$

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

Roots:

$x+3=0$ or $x-3=0$
$x=-3$ $\quad$ $x=3$

Roots: $(-3,0)$ and $(3,0)$

Standard form:

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

$f(x)=x^2-3x+3x-9$

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

$A=1, B=0, C=-9$

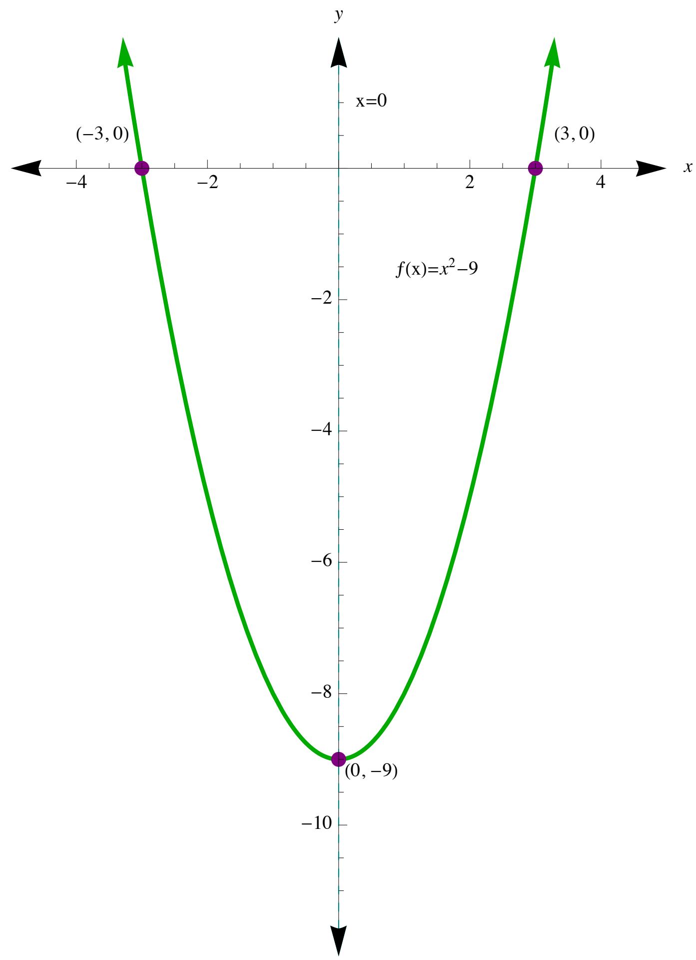
Vertex: $x=\frac{-B}{2A}=\frac{-(0)}{2(1)}=\frac{0}{2}=0$

$f(0)=(0)^2-9=-9$

Vertex: $(0,-9)$

Axis of symmetry: $x=0$

$y-\text{int}: (0,-9)$



5. $f(x)=(3x-5)(x+7)$

Roots:

$3x-5=0 \quad \text{or} \quad x+7=0$

$3x=5 \qquad x=-7$

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

Roots: $\left(1\frac{2}{3},0\right)$ and $(-7,0)$

Standard form:

$f(x)=(3x-5)(x+7)$

$f(x)=3x^2+21x-5x-35$

$f(x)=3x^2+16x-35$

$A=3, B=16, C=-35$

Vertex: $x=\frac{-B}{2A}=\frac{-(16)}{2(3)}=\frac{-16}{6}=-\frac{8}{3}=-2\frac{2}{3}$

$f\left(-\frac{8}{3}\right)=3\left(-\frac{8}{3}\right)^2+16\left(-\frac{8}{3}\right)-35$

Work with fractions:

$\left(-\frac{8}{3}\right)^2=\left(-\frac{8}{3}\right)\left(-\frac{8}{3}\right)=\frac{64}{9}$

$3\left(\frac{64}{9}\right)=\left(\frac{3}{1}\right)\left(\frac{64}{9}\right)=\frac{192}{9}=\frac{64}{3}$

$16\left(-\frac{8}{3}\right)=\left(\frac{16}{1}\right)\left(-\frac{8}{3}\right)=-\frac{128}{3}$

$f\left(-\frac{8}{3}\right)=\frac{64}{3}-\frac{128}{3}-35$

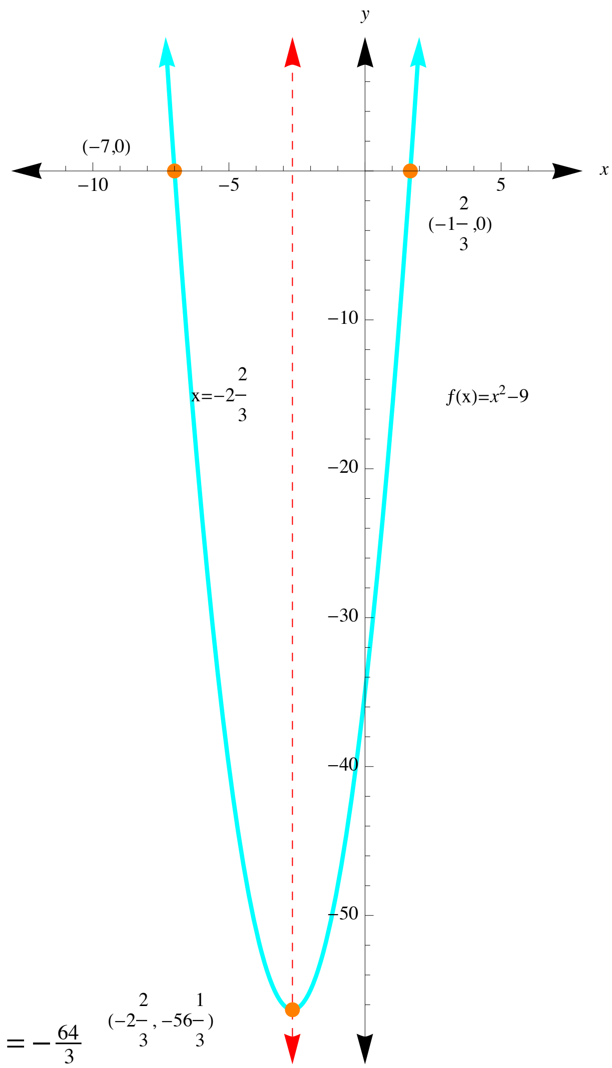
$\frac{64}{3}-\frac{128}{3}=\frac{(64)(3)-(3)(128)}{(3)(3)}=\frac{192-384}{9}=\frac{-192}{9}=-\frac{64}{3}$

$-\frac{64}{3}-35=-\frac{64}{3}-\frac{35}{1}=-\frac{(64)(1)+(3)(35)}{(3)(1)}=-\frac{64+105}{3}=-\frac{169}{3}=-56\frac{1}{3}$

Vertex: $\left(-2\frac{2}{3},-56\frac{1}{3}\right)$

Axis of symmetry: $x=-2\frac{2}{3}$

$y-\text{int}:(0,-35)$



6. $f(x)=(-x+5)(2x+3)$

Roots :

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

$-x=-5$ $\quad$ $2x=-3$

$x=5$ $\quad$ $x=-\frac{3}{2}=-1.5$

Roots : $(5,0)$ and $(-1.5,0)$

$f(x)=-2x^2-3x+10x+15$

$f(x)=-2x^2+7x+15$

$A=-2, B=7, C=15$

Vertex : $x=\frac{-B}{2A}=\frac{-(7)}{2(-2)}=\frac{-7}{-4}=\frac{7}{4}=1.75$

$f(1.75)=-2(1.75)^2+7(1.75)+15$

Work with decimals:

$(1.75)^2$:

$$\begin{array}{r} 1.75 \\ \times\ 1.75 \\ \hline 875 \\ 12250 \\ +\ 17500 \\ \hline 30625 \end{array}$$

$(1.75)^2=3.0625$

$-2(3.0625)$:

$$\begin{array}{r} 3.0625 \\ \times\ 2 \\ \hline 61250 \end{array}$$

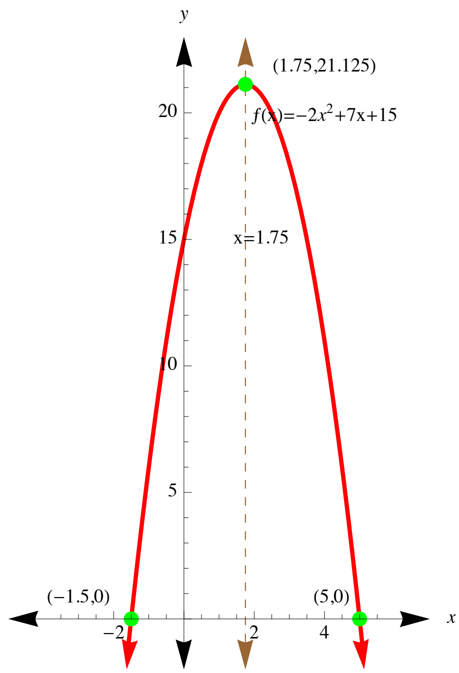
$-2(3.0625)=-6.125$

$7(1.75)$:

$$\begin{array}{r} 1.75 \\ \times\ 7 \\ \hline 1225 \end{array}$$

$7(1.75)=12.25$

$f(1.75)=-6.125+12.25+15$



$-6.125+12.25$:

$$\begin{array}{r} \overset{0}{\not 1}\ \overset{12}{\not 2}.\ 2\ \overset{4}{\not 5}\ \overset{10}{\not 0} \\ -\ 6.125 \\ \hline 6.125 \end{array}$$

$-6.125+12.25=6.125$

$6.125+15$:

$$\begin{array}{r} 6.125 \\ +\ 15.000 \\ \hline 21125 \end{array}$$

$6.125+15=21.125$

$f(1.75)=21.125$

Vertex : $(1.75, 21.125)$

Axis of symmetry : $x=1.75$

y – int : $(0,15)$

