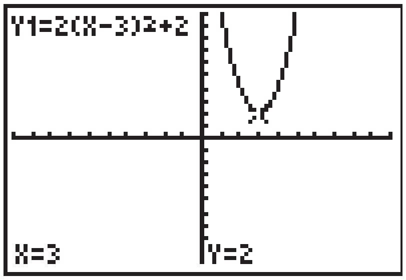
c) A quadratic function of the form $y = a(x - p)^2 + q$ will have no real roots if $a > 0$ and the vertex is above the x-axis.

Example: $y = 2(x - 3)^2 + 2$ or $0 = 2x^2 - 12x + 20$



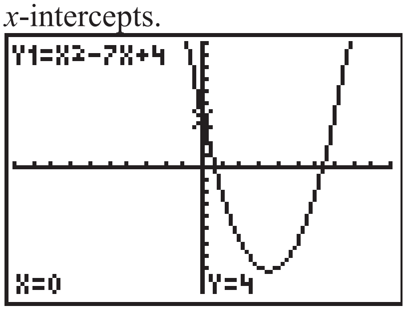
Section 4.4 The Quadratic Formula

Section 4.4 Page 254 Question 1

a) For $x^2 - 7x + 4 = 0$, $a = 1$, $b = -7$, and $c = 4$.

$b^2 - 4ac = (-7)^2 - 4(1)(4)$
$b^2 - 4ac = 49 - 16$
$b^2 - 4ac = 33$

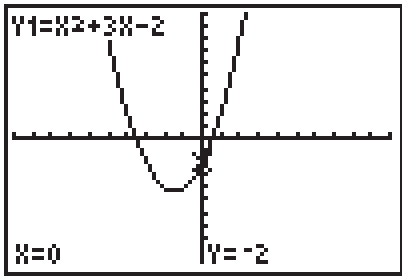
Since the value of the discriminant is positive, there are two distinct real roots.
The graph of the corresponding quadratic function confirms that there are two distinct x-intercepts.



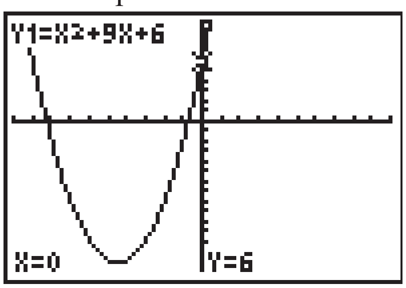
b) For $s^2 + 3s - 2 = 0$, $a = 1$, $b = 3$, and $c = -2$.

$b^2 - 4ac = 3^2 - 4(1)(-2)$
$b^2 - 4ac = 9 + 8$
$b^2 - 4ac = 17$

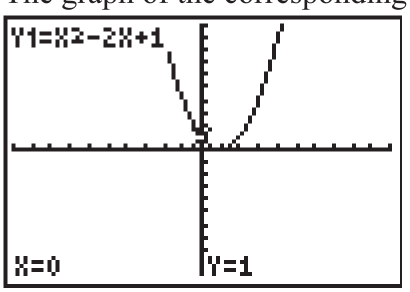
Since the value of the discriminant is positive, there are two distinct real roots.
The graph of the corresponding quadratic function confirms that there are two distinct x-intercepts.



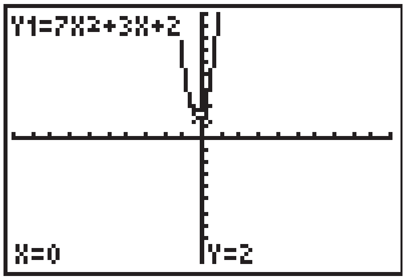
c) For $r^2 + 9r + 6 = 0$, $a = 1$, $b = 9$, and $c = 6$.
$b^2 - 4ac = 9^2 - 4(1)(6)$
$b^2 - 4ac = 81 - 24$
$b^2 - 4ac = 57$
Since the value of the discriminant is positive, there are two distinct real roots.
The graph of the corresponding quadratic function confirms that there are two distinct x-intercepts.



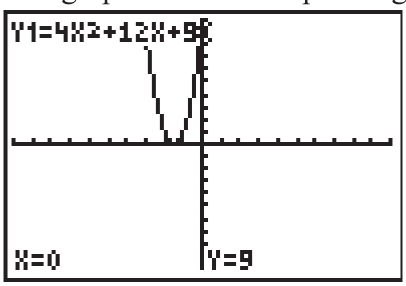
d) For $n^2 - 2n + 1 = 0$, $a = 1$, $b = -2$, and $c = 1$.
$b^2 - 4ac = (-2)^2 - 4(1)(1)$
$b^2 - 4ac = 4 - 4$
$b^2 - 4ac = 0$
Since the value of the discriminant is zero, there is one distinct real root.
The graph of the corresponding quadratic function confirms that there is one x-intercept.



e) For $7y^2 + 3y + 2 = 0$, $a = 7$, $b = 3$, and $c = 2$.
$b^2 - 4ac = 3^2 - 4(7)(2)$
$b^2 - 4ac = 9 - 56$
$b^2 - 4ac = -47$
Since the value of the discriminant is negative, there are no real roots.
The graph of the corresponding quadratic function confirms that there are no x-intercepts.



f) For $4t^2 + 12t + 9 = 0$, $a = 4$, $b = 12$, and $c = 9$.
$b^2 - 4ac = 12^2 - 4(4)(9)$
$b^2 - 4ac = 144 - 144$
$b^2 - 4ac = 0$
Since the value of the discriminant is zero, there is one distinct real root.
The graph of the corresponding quadratic function confirms that there is one x-intercept.



Section 4.4 Page 254 Question 2

a) For $f(x) = x^2 - 2x - 14$, $a = 1$, $b = -2$, and $c = -14$.
$b^2 - 4ac = (-2)^2 - 4(1)(-14)$
$b^2 - 4ac = 4 + 56$
$b^2 - 4ac = 60$
Since the value of the discriminant is positive, the function has two zeros.

b) For $g(x) = -3x^2 + 0.06x + 4$, $a = -3$, $b = 0.06$, and $c = 4$.
$b^2 - 4ac = 0.06^2 - 4(-3)(4)$
$b^2 - 4ac = 0.0036 + 48$
$b^2 - 4ac = 48.0036$
Since the value of the discriminant is positive, the function has two zeros.

c) For $f(x) = \frac{1}{4}x^2 - 3x + 9$, $a = \frac{1}{4}$, $b = -3$, and $c = 9$.
$b^2 - 4ac = (-3)^2 - 4\left(\frac{1}{4}\right)(9)$
$b^2 - 4ac = 9 - 9$
$b^2 - 4ac = 0$
Since the value of the discriminant is zero, the function has one zero.

d) For $f(v) = -v^2 + 2v - 1$, $a = -1$, $b = 2$, and $c = -1$.
$b^2 - 4ac = 2^2 - 4(-1)(-1)$
$b^2 - 4ac = 4 - 4$
$b^2 - 4ac = 0$
Since the value of the discriminant is zero, the function has one zero.

e) For $f(x) = \frac{1}{2}x^2 - x + \frac{5}{2}$, $a = \frac{1}{2}$, $b = -1$, and $c = \frac{5}{2}$.
$b^2 - 4ac = (-1)^2 - 4\left(\frac{1}{2}\right)\left(\frac{5}{2}\right)$
$b^2 - 4ac = 1 - 20$
$b^2 - 4ac = -19$
Since the value of the discriminant is negative, the function has no zeros.

f) For $g(y) = -6y^2 + 5y - 1$, $a = -6$, $b = 5$, and $c = -1$.
$b^2 - 4ac = 5^2 - 4(-6)(-1)$
$b^2 - 4ac = 25 - 24$
$b^2 - 4ac = 1$
Since the value of the discriminant is positive, the function has two zeros.

Section 4.4 Page 254 Question 3

a) For $7x^2 + 24x + 9 = 0$, $a = 7$, $b = 24$, and $c = 9$.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
$$x = \frac{-24 \pm \sqrt{24^2 - 4(7)(9)}}{2(7)}$$
$$x = \frac{-24 \pm \sqrt{324}}{14}$$
$$x = \frac{-24 \pm 18}{14}$$

$x = \frac{-24 + 18}{14}$ or $x = \frac{-24 - 18}{14}$

$x = \frac{-6}{14}$ $\qquad$ $x = \frac{-42}{14}$

$x = -\frac{3}{7}$ $\qquad$ $x = -3$

The roots are $-\frac{3}{7}$ and -3.