There are no quadruple, quintuple, ... roots (i.e. no zeros appear more than 3 times on any problem)

1. Sketch the graph of each equation; label any x or y-intercepts with their coordinates.

(a) \( y = -(x + 4)(x - 1)^2 \)

(b) \( y = x^3(x + 2)^2(x - 4) \)

(c) \( y = \frac{2x^2 + 5x - 3}{(2x - 1)(x + 3)} \) \( \frac{-6}{-1 + 6} \) \( \frac{-6}{5} \)

(d) \( y = -3x^4 + 7x^3 - 4x^2 \) \( -x^2(3x^2 - 7x + 4) \) \( \frac{-12}{-3 - 4} \) \( \frac{-12}{-7} \)

\( x = \frac{-b}{2a} = \frac{-5}{4} \)

\( y = 2\left(\frac{-5}{4}\right)^2 + 5\left(\frac{-5}{4}\right) - 3 \)

\( 2\left(\frac{25}{16}\right) + \frac{-25}{4} - \frac{3}{8} \)

\( \frac{25}{8} - \frac{25}{8} - \frac{3}{8} = -\frac{9}{8} \)
2. Give an equation for each polynomial graph shown.

(a) \[ y = \frac{1}{4} (x+2)(x-3)^3 \]

\[ y = a \cdot (x+2)(x-3)^3 \]

\[ -16 = a \cdot (-1+2) \cdot (-1-3)^3 \]

\[ -16 = -6a \cdot 4^3 \]

\[ -16 = -64a \]

\[ a = \frac{1}{4} \]

(b) \[ y = 2x(x+1)^2(x-4)^2 \]

\[ y = a(x)(x+1)^2(x-4)^2 \]

\[ 96 = a(3)(3+1)^2(3-4)^2 \]

\[ 96 = 48a \]

\[ a = 2 \]

3. Determine algebraically where the graphs of \( y = 2x^3 - 4x \) and \( y = -3x \) intersect. Give the coordinates of any points of intersection.

\[ 2x^3 - 4x = -3x \]

\[ 2x^3 - x = 0 \]

\[ x(2x^2 - 1) = 0 \]

\[ 2x^2 - 1 = 0 \]

\[ 2x^2 = 1 \]

\[ x^2 = \frac{1}{2} \]

\[ x = \pm \frac{\sqrt{2}}{2} \]

4(a). Sketch a graph of a quintic function with a negative leading coefficient and a double root.

(b) Write an equation for your graph:

\[ y = - (x+2)^2(x+1)(x-1)(x-2) \]

or \[ y = (x+2)^2(x+1)(x-1)(2-x) \]