

For each problem, show your work.

1. **(9 points)** Answer the following questions about the quadratic function $f(x) = -3x^2 + 12x - 4$.
 - (a) **(1 point)** Calculate the y -intercept of this function.
 - (b) **(3 point)** Calculate the x -intercepts, if any, of this function. If it has no x -intercepts, explicitly say so.
 - (c) **(3 points)** Write the above quadratic function in standard form.
 - (d) **(2 points)** What are the coordinates of the vertex of this function's graph? Is the vertex a maximum, a minimum, or neither?

2. **(11 points)** Let $f(x) = 3x^3 - 5x^2 - 8x - 2$. Answer the following questions about this polynomial function.
 - (a) **(1 point)** Calculate the y -intercept of this function.
 - (b) **(3 points)** Briefly describe the long-term behavior of this function on both ends, i.e., describe the value of $f(x)$ when x is a very large positive number, and when x is a large-magnitude negative number.
 - (c) **(3 points)** Determine, without actually performing any divisions, which values *could* be rational roots of the polynomial.
 - (d) **(4 points)** Calculate all the real roots of the polynomial.