

Third Quiz for Math 30, section 6432

Directions: You should fully justify your answers. Do all your work on separate paper, and make sure to *print* your name in the first sheet and staple all the sheets together. **Unstapled, loose pieces of paper will not be graded.** This quiz is due Wednesday March 4, at 6:00 PM.

- Graph each of the following quadratic functions. In each case you should identify the vertex, the axis of symmetry, and possible x and y intercepts.
 - $f(x) = x^2 + x - 2$
 - $g(x) = x^2 + 2x + 5$
 - $h(x) = x^2 + 4x + 4$

- For each of the following functions draw a rough but “qualitatively accurate” graph. The graph should correctly reflect the end behavior, the behavior near zeros and the number of turning points.

(a) $y = (x - 1)(x - 2)(x - 3)$

(b) $y = (2x - 1)(x + 1)^2(3x - 6)(x + 3)^2$

(c) $y = x^3(x + 2)^2(x - 1)(x - 2)^4$

(d) $y = x^4 - 7x^3 + 12x^2$

- Consider the following equation:

$$f(x) = 3x^4 + 4x^3 - 13x^2 + 12x - 4$$

Prove that this equation has at least one zero in the interval $(0, 1)$, i.e. prove that for some a with $0 < a < 1$ we have that $f(a) = 0$.

- Extra Credit:** A ball is thrown upwards with an initial velocity of 48 ft/sec from the top of 144-foot building. The height of the ball at time t is then given by:

$$h(t) = -16t^2 + 48t + 144.$$

What is the maximum height that the ball achieves?