Name: ——————————————————————— ——————— / **25**

There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. **Show all work for full credit.**

1. **[8 points]** Follow the steps below to solve a related rates problem.

   a. Assume the base, b, of a triangle is growing at a rate of 2 feet per minute and the height, h, of the triangle is shrinking at a rate of 4 feet per minute when the base is 10 feet long and height is 15 feet long. Using this information, identify values for h, b, dh/dt and db/dt.

   b. The area of a triangle is given by the formula $A = \frac{1}{2}bh$ where b is the length of the base of the triangle and h is its height. Take the derivative of the above equation implicitly with respect to time.

   c. Use the above information to determine the rate of change of the area of the triangle. Include units.

   d. Is the area increasing or decreasing at this instant? Justify your answer.

2. [8 points] Let $f(x) = x^4$.

    a. Find the linear approximation, $L(x)$, of $f(x)$ at $x = 2$.

    b. Use the linear approximation to estimate $(1.8)^4$. Your answer here must be in the form of a simplified fraction.

3. [9 points] Let $g(x) = 3x^4 - 4x^3$.

    a. Find all critical points of $g(x)$.

    b. Determine the **absolute** minimum and **absolute** maximum of $g(x)$ on the interval $[-1, 2]$. Make sure to show your work.