Name and section: _____

1. For the following functions find and classify all extremma using the first derivative test. Show all work including the first derivative number line and the (x, y) coordinates of the critical points.

   (a) $f(x) = 2x^3 - 3x^2 - 12x$

(b) $f(x) = (x-5)^3(2x+3)^6$

2. Find and classify all extremma using the second derivative test. Show all work include the (x, y) coordinates of the critical points.

$$f(x) = 4x^3 - 16x$$

3. Find and classify all possible points of inflection. Show all work including the second derivative number line and the (x, y) coordinates of the points of inflection.

$$f(x) = 4x^3 - 16x$$

4. Find the indicated limit.

   (a) $\lim_{x\to 0} \frac{e^{3x}-1}{\sin(4x)}$

   (b) $\lim_{x\to 0} \frac{\sin(x^2)}{x\sin(x)}$

(c) $\lim_{x\to\infty} \frac{\ln(x)}{e^x}$

(d) $\lim_{x\to 0^+} \frac{\ln(1+2x)}{\frac{1}{3x}}$

5. The volume of a spherical balloon is increasing at a rate of 10 cubic inches per second. When the radius is 6 inches, how fast is the surface area of the balloon increasing?

6. A 12 foot ladder is sliding down the wall at a rate of 0.5 ft per minute. When the ladder is 8 feet high on the wall how fast is the foot of the ladder sliding away from the wall?