Test 2 **MA 125 -02 (Form B)** **October 10, 2016**

Name: _____ **Signature:** _____

SHOW ALL YOUR WORK!

1. [36 points] Find the derivative of the following functions

   (a) $q(t) = 3^t(t^5 + 2t^2 + 5)$

   (b) $f(t) = \sec(e^{\sqrt{t}} + 3t)$

   (c) $f(x) = 3x^4 + 5\sqrt[3]{x} - \dfrac{2}{\sqrt{x}} + \pi$

   (d) $g(t) = 2^t + \tan(t)$

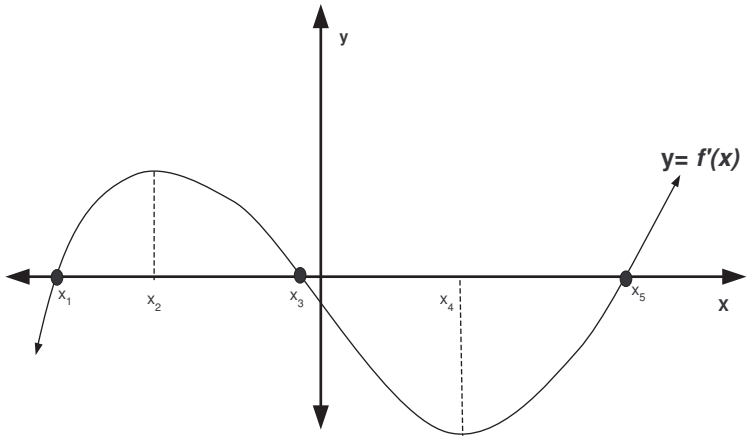
   (e) $h(x) = \dfrac{ax - b}{cx + 1}$

   (f) $g(x) = \sqrt{1 + \sin^2(2x + 1)}$

2. [10 points] A laboratory study investigating the relationship between diet and weight in adult humans found that the weight of a subject, W, in pounds, was a function, $W = f(c)$, of the average number of Calories per day c, consumed by a subject. In terms of diet and weight, interpret the meaning of $f'(2000) = 0$ and $f^{-1}(162) = 2200$.

3. [10 points] Find the equation of the tangent line to the graph of function $f(x) = 2^x - 3x^2 + 1$ for $x = 1$.

4. [24 points] Given the following graph of the **derivative function** f'.



Find the intervals where the function is:

(a) $f(x)$ is decreasing.

(b) $f(x)$ is increasing.

(c) $f(x)$ is concave down.

At what of the marked x-values can the following be true:

(d) $f(x)$ has a local minimum.

(e) $f(x)$ has a local maximum.

(f) $f(x)$ has an inflection point.

[Bonus 2 points] Find $\lim_{x\to\infty} f(x)$, explain.

5. [20 points] Given that $f(2) = 1$ and $f'(2) = 5$, find the following:

   (a) The equation of the tangent line of f at $x = 2$, then use it to approximate $f(2.01)$.

   (b) Assume that $h > 0$ and small and $f''(2) > 0$, order $\frac{f(2)-f(2-h)}{h}$, $f'(2)$ and $\frac{f(2+h)-f(2)}{h}$ from greatest to least. Explain.

   (c) Let $g(x) = \sqrt{f(x)+1}$, find $g'(2)$.

   (d) Find $\lim_{h\to 0} \dfrac{f(2+10h) - f(2)}{h}$