Name:_____

MA 2310: Test 2

No calculators and show all work.

1. Assume a spherical balloon is being blown up with a rate of $300in^3/s$. When the radius is 4 inches how fast is the surface area of the ballon increasing?

2. What intervals is $f(x) = (x-1)^3(x+2)$ is increaing or decreasing? Draw the first derivative number line and identify maximum and minimum.

3. What intervals is $f(x) = e^{-x^2}$ concave up or convave down? Draw the second derivative number line and identify points of concavity.

4. The farmer now is going to build a fenced in pen along the the side of the barn. So the farmer only needs to build three sides of the pen (the barn will serve as the fourth side of the pen). She has 200 linear feet of fencing and she wishes to maximize the area. What are the dimensions of maximum area?

5. Compute the derivative of $y = (2x^3 + 1)^x$.

6. Let $s(t) = -16t^2 + 64t + 1$ represent the position of a particle.

   (a) Find the position, velocity and acceleration of the particle at time $t = 1$.

   (b) At what time does the particle stop moving?

7. Find the following limits.

(a) $\lim_{x \to 0} \dfrac{\cos(3x) - 1}{7x^2}$

(b) $\lim_{x \to 0} \dfrac{e^{x^2} - 1 - x^2}{x^4}$

(c) $\lim_{x \to 0^+} (1 - 3x)^{1/x}$

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

8. Find the Antiderivatives for the following:

(a) $\int x^2 + \sin(x) - \frac{2}{x} + \frac{3}{x^2}\, dx$

(b) $\int x \sin(x^2 + 1)\, dx$ let $u = x^2 + 1$