EXAM 2: MATH 220 - Calculus 1

July 11th 2017

Name:

Instructor:

1	2	3	4	5	6	7	8	9	Total

Instructions: You have 1 hour and 15 minutes to complete this exam. Show all of your work. Calculators are not allowed.

1) (16 points) Let $f(x) = x^3 - 2x^2 + x - 1$. Find the intervals on which f is concave up or concave down, increasing or decreasing, the points of inflection, the critical points, and the local minima and maxima.

2) (4 points each) Evaluate the following limits (Hint: you may need to apply L'Hopital's Rule):

a) $\lim_{\theta \to \pi} \frac{cos(\theta)+1}{\theta \sin(\theta)}$

b) $\lim_{x \to \infty}(e^{-2x}(x^2 - x - 4))$

3) (8 points) Verify the Mean Value Theorem for the function $f(x) = x^3 + x$ on the interval $[-2, 1]$.

4) (12 points) Find the derivative of $y = \frac{(x+2)^3}{(x+5)(3x-4)}$ using logarithmic differentiation.

5) (12 points) Compute $\frac{dy}{dx}$ of $3xy^2 = y^3 - \cos(x)$ (Hint: use implicit differentiation).

6) (12 points) An architect plans to enclose a 750 square foot rectangular region in a botanical garden. She will use shrubs costing 10 per foot along three sides and fencing costing 5 per foot along the fourth side. Find the minimum total cost.

7) (4 points each) Compute the derivative of the following functions:

a) $f(x) = \tan(\ln(6x^4 + x^2))$

b) $y = e^{sin(x)}$

d) $g(t) = (5 + (2x^2 - 1)^3)^{1/3}$

8) (12 points) A plane is flying away from you at 500 mph at a height of 3 miles. How fast is the plane's distance from you increasing at the moment when the plane is flying over a point on the ground 4 miles from you?

9) (8 points) Sketch the graph of a function with the following features:
(i) $f'(x) > 0$ for $x < -1$ and $x > 3$ and $f'(x) < 0$ for $-1 < x < 3$, and
(ii) $f''(x) < 0$ for $x < 1$ and $f''(x) > 0$ for $x > 1$