Math 0220

Midterm Exam 2

Fall 2017

Name: _____

No calculators, no books. Show all your work (no work = no credit).
Write neatly. Simplify your answers when possible.

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1. (10 points) The function $g(x) = 5 + 2x + e^x$ is one-to-one. Find $\left(g^{-1}\right)'(6)$.

2. Find the limit, if it exists. If the limit does not exist explain why. You may use the L'Hospital's Rule.

(a) (10 points) $\lim_{x \to 0} \dfrac{e^{8x} - 1}{2x}$

(b) (10 points) $\lim_{x \to \infty} x^2 e^{-3x}$

(c) (10 points) $\lim_{x \to 0} \dfrac{x - \tan 2x}{\sin 3x}$

3. (10 points) A piece of wire 10 meters long is to be cut into two pieces. Both pieces are bent into squares. How should the wire be cut so that the total area enclosed by the two squares is minimized? Use optimization method to solve the problem.

4. (10 points) Use Newton's method with the initial approximation $x_1 = 2$ to find the second approximation x_2 to the number $\sqrt{6}$. (Write your answer as a reduced fraction).

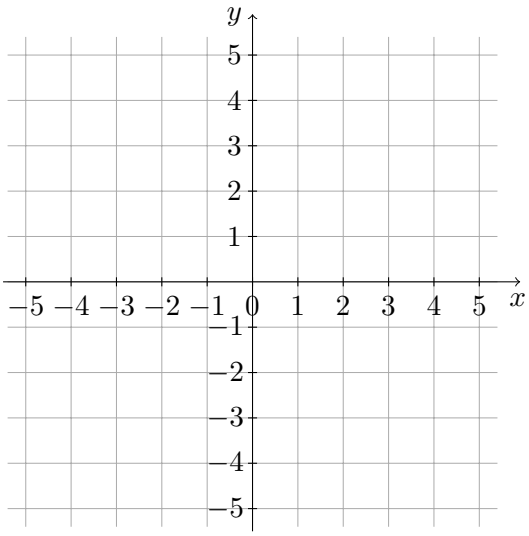
5. For the function $f(x) = 2 + 3x - x^3$

(a) (6 points) Find the intervals of increase or decrease.

(b) (6 points) Find the local maximum and local minimum values.

(c) (5 points) Find the intervals of concavity and the inflection points.

(d) (5 points) Use the information from previous parts to sketch the graph of $f(x)$.



6. Find antiderivative $F(x)$ for the function

(a) (6 points) $f(x) = 2 + e^x$

(b) (6 points) $f(x) = \sqrt[3]{x} + \dfrac{1}{x}$

(c) (6 points) $f(x) = 3\sin x + \sec^2 x$

bonus problem (10 points extra) Evaluate the limit $\lim_{x\to\infty} \left(1+\frac{1}{x}\right)^{2x}$