Math 130 Exam 2 Sample 1

Directions: Do not simplify unless indicated. Non-graphing calculators are permitted. Show all work as appropriate for the methods taught in this course. Partial credit will be given for any work or words which are relevant to the problem. Units should be included for all real-world problems.

Please put problem 1 on answer sheet 1

1. Calculate each of the following derivatives:

   (a) $\frac{d}{dt}\,(t-2)^2(t+1)$. Simplify.

   (b) $\frac{d}{dx}\,\log_3(x^2-3x+1)$

   (c) $\frac{d}{dx}\,e^{2-\ln(x+1)}$

   (d) $\frac{d}{dx}\,\frac{2^x(x^7+3x-1)}{x-5}$

Please put problem 2 on answer sheet 2

2. (a) Find the equation of the line tangent to the graph of $f(x)=x\log_3 x$ at $x=9$. Simplify.

   (b) Show that the function $f(x)=x\ln x$ for $x>0$ has no inflection point.

Please put problem 3 on answer sheet 3

3. (a) Suppose the number of people who have joined an organization t weeks after it was created is $P(t)=3+2\sqrt{5t+7}$. Find and interpret $P(3)$ and $P'(3)$. Give exact answers and approximations to two decimal places.

   (b) The amount of air in a hyperventilating person's lungs in liters after t minutes is given by $V(t)=3+0.05\sin\left(160\pi t-\frac{\pi}{2}\right)$. Find and interpret $V(0.01)$ and $V'(0.01)$. Give exact answers and approximations to two decimal places.

Please put problem 4 on answer sheet 4

4. (a) A certain drug is administered to a patient. After t hours the concentration is

$$C(t)=\frac{5t}{t^2+9}$$

   Find the largest interval on which the concentration is increasing.

   (b) Find the x-value of all point(s) where the function $g(x)$ has a relative maximum or minimum. Identify each.

$$g(x)=\ln\left((x+3)^4+32\right)$$

Please put problem 5 on answer sheet 5

5. Find and use all of: y-intercept, increasing/decreasing, relative extrema, and concavity to sketch the graph of

$$h(x)=x^4-18x^2+5$$