

# PRACTICE EXAM 2 - MATH 160

DATE: Friday, November 6

INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 25 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.

**GOOD LUCK!!**

- Find the derivative  $y'$  if  $\frac{x+y}{x-y} = 3x$ . (10 points)
  - The volume  $V$  of a cube with sides of length  $x$  inches is changing with respect to time. At a certain instant of time the sides are 5 inches long and are increasing at a rate of 0.1 inch per second.
    - Write an equation relating the volume of the cube with the length of each of its sides. (5 points)
    - How fast is the volume of the cube changing at the given instant of time? (10 points)
- Find the intervals of monotonicity of the function  $f(x) = x^4 - 2x^2 + 4$  (5 points)
  - Find the relative maxima and the relative minima, if any, of the function  $f(x) = x + \frac{9}{x} + 2$  (5 points)
  - Find the intervals of concavity and the inflection points of the function  $f(x) = x^4 - 2x^3 + 6$ . (10 points)
  - Use the second derivative test to find the relative extrema of  $f(x) = x^2 + \frac{2}{x}$ . (5 points)
- Sketch the graphs of  $f(x) = 3^x$  and  $g(x) = \log_{\frac{1}{2}} x$  on the same system of coordinate axes. (10 points)
  - Solve the exponential equation  $27^x = (\frac{1}{81})^{x-2}$  (5 points)
  - Solve the logarithmic equation  $\log_2 x + \log_2 (x - 6) = 4$  (10 points)
- Find an equation of the tangent line to  $f(x) = x^3 e^{2x}$  at  $x = 1$ . (5 points)
  - Find the intervals of concavity and the relative extrema of  $f(x) = x e^x$ . (10 points)
  - Compute the derivative of  $f(x) = e^x \ln \sqrt{x+3}$ . (5 points)
  - Use logarithmic differentiation to find the derivative of  $y = x^{x+2}$ . (5 points)