

Math 157 - Test 3a
November 20, 2013

Name _____

Score _____

Show all work. Supply explanations when necessary.

1. (10 points) Find open intervals on which the graph of $f(x) = x^4 + x^3 - 3x^2 + 1$ is concave up/down. Also identify all points of inflection.

2. (5 points) In solving an optimization problem, Joe found that $x = 1$ is a critical number of the function $P(x) = 2x + \frac{2}{x}$. Show that Joe's critical number minimizes P .

3. (7 points) The revenue, in dollars, generated by selling x units of a certain product is given by $R(x) = 50xe^{-0.0025x}$. Use differentials to estimate the change in revenue as x changes from 1000 to 1050.
4. (11 points) A rancher has 200 feet of fencing to enclose two adjacent rectangular corrals (which share one common side). What dimensions should be used so that the enclosed area will be a maximum?

5. (3 points) Use the exponent laws to simplify each expression.

(a) $(5^7)(5^{-3})$

(b) $(e^3)^x$

6. (4 points) Use the logarithm laws to expand or condense each expression as appropriate.

(a) $3\log_2 x - 2\log_2(x - 1)$

(b) $\ln\left(\frac{(x+1)^2}{y-1}\right)$

7. (3 points) Find the **exact** value of each expression.

(a) $\log_6 36$

(b) $e^{\ln\sqrt{5}}$

(c) $\ln e^\pi$

8. (5 points) Make a table of some values of the function $f(x) = 3^x$. Then plot points to sketch the graph.

9. (9 points) Solve for x .

(a) $\ln x^3 = 6$

(b) $4e^{2x-3} - 5 = 0$

(c) $\ln x + \ln(x - 3) = 0$

10. (6 points) Let $g(x) = 8x^5 - 5x^4 - 20x^3$. Without looking at the graph of g , determine whether the graph is concave up or concave down at the point where $x = 1$.

11. (12 points) Determine the derivative of each function. It may be helpful to use exponent laws, logarithm laws, or change-of-base formulas to simplify the functions before differentiation.

(a) $f(x) = (e^x)^2$

(b) $g(t) = \ln[t^2(t + 4)^3]$

(c) $f(x) = \log_5 x$

Math 157 - Test 3b

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Show all work. Supply explanations when necessary. YOU MUST WORK INDIVIDUALLY ON THIS EXAM.

1. (9 points) The revenue, in dollars, generated by selling x units of a certain product is given by $R(x) = 50xe^{-0.0025x}$. Determine the maximum revenue.

2. (8 points) The circumference of a circle is measured to be 48 cm with an error of ± 0.2 cm. Use differentials to estimate the propagated error in the circle's area.

3. (8 points) The half-life of radioactive radium (^{226}Ra) is 1599 years. How long will it take a sample of 200 g to decay to 20 g? What percent of a given amount will remain after 1000 years?