

MATH 211, Spring, '00

NAME _____

Holland, EXAM III

SIGNATURE _____

SSN _____

SECTION _____

INSTRUCTIONS:

1. Make certain that your test has all five (5) different sheets (including the cover page).
2. Put your answers in the BOXES provided with the problem.
3. You must SHOW YOUR WORK in order to get credit. All work should be organized to be readable and must be of sufficient depth to justify your answer. Correct answers with incorrect work or insufficient justification will receive no credit.
4. NO CALCULATORS are allowed.

1. (12 points) Solve for x .

(a) $1 = e^{-2x}e^{5x+3}$

(b) $1 = \ln(8x^2) - \ln(2x)$

2. (15 points) Differentiate.

(a) $y = e^{x^2+1}$

(b) $y = x^2 \ln(x)$

(c) $y = \ln\left(\frac{e^{3x}\sqrt{x}}{(x^3+2)^4}\right)$

3. (12 points) Find all values of x at which the following functions have horizontal tangents.

(a) $y = (5x - 2)e^{1-2x}$

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

4. (15 points) Compute the following antiderivatives.

(a) $\int (4e^{5x} + 2)dx$

(b) $\int \left(\frac{2}{3x^4} + \sqrt{x} \right) dx$

(c) $\int \left(\frac{6}{5x} + x^3 \right) dx$

5. (10 points) A certain radioactive substance has a half-life of 40 years. Find the decay constant for the substance.

6. (10 points) A bacterial culture grows at a rate proportional to its size. An initial population of 50 bacteria grows to 2,000 bacteria in 3 hours. Find the formula $P(t)$ for the size of the population after t hours.

7. (10 points) The size of an insect population is given by $P(t) = 300e^{0.1t}$. How long does it take the population to triple?

8. (10 points) A ball is thrown upward from a height of 256 feet above the ground. Its velocity, t seconds after it is thrown, is given by $v(t) = 96 - 32t$ (feet per second). Find the formula for $s(t)$, the height of the ball t seconds after it is thrown.

9. (6 points) Use logarithmic differentiation to find $\frac{dy}{dx}$, where

$$y = \frac{e^{4x}(x+2)^4}{x^3(3x-5)^7}.$$