date: the 20^{th} of November, 1998

place: room 221 Hayes

time: 8:30-9:20

111 - Exam III

This exam contains 10 problems worth 10 points each. You may use only a blank sheet of paper, a pencil, a rubber gum, a ruler and a small calculator. You can use your calculator only to add, substract, multiply or divide two numbers. This exam is taken under the honor code.

Name:

Recommendation

Never give a "solitary" answer without justifying it by previous calculations or reasoning.

Problems

1. Find a formula for $\frac{d}{dx} f(g(x))$, where $f(x)$ is a function such that $f'(x) = x\sqrt{1-x^2}$ and $g(x) = x^{\frac{3}{2}}$.

that

$$\frac{dy}{du} = \frac{u}{u^2+1}$$

and $u = \frac{2}{x}$.

2. Calculate $4^{\cdot 2} \cdot 4^{\cdot 3}$.

3. Simplify the expression

$$e^{\ln(x^2)}.$$

4. Solve the equation $e^{-5x} \cdot e^4 = e$ for x.

5. Differentiate the function $\ln(x^2 + e^x)$.

6. Determine all solutions of the differential equation $y' = \frac{1}{3}y$.

7. The herring gull population in North America has been doubling every 13 years since 1900. Give a differential equation satisfied by $P(t)$, the population t years after 1900 (*hint:* $\ln 2 = .69$).

8. One thousand dollars is deposited in a savings account at 10 % interest compounded continuously. How many years are required for the balance in the account to reach \$ 3000 (*hint:* $\ln 3 = 1.1$)?

9. A piece of charcoal found at Stonehenge contained 63 % of the level of ^{14}C found in living trees. Approximately how old is the charcoal (*hint: the decay constant* $= .00012$*;* $\ln 0.63 = -.46$)?

10. A stock portfolio increased in value from \$ 100,000 to \$ 117,000 in 2 years. What rate of interest, compounded continuously, did this investment earn (*hint:* $\ln 1.17 = 0.16$)?

Good luck!