

Review Problems — Final Exam

December 16, 2003

Name: _____

Closed book and notes; calculators not permitted.

1. Are there any real numbers x such that

$$2 \ln(x + 1) = \ln(x - 1) + 1$$

If so, find them.

2. Differentiate:

(a) $\frac{d}{dx}[\ln(s^2 + x + 10)]$.

(b) $\frac{d}{dx}[\ln(x)^2 - \ln(x^2)]$.

3. Find an expression for

$$\frac{d}{dx}[(x - 1)(x + 2)(x^2 + 1)(x^2 - 3)]$$

4. An Archaeologist finds a bone containing 27% of the ^{14}C found in living material. How old is the bone. (The half-life of ^{14}C is 5730 years.)
5. You win a lottery with two payout options. You can take \$550 today, or you can receive \$700 in two years. You can invest money at 5% interest, compounded annually. Which payout option should you choose?

6. A certain product satisfies the demand equation

$$xp + x^3 = 125,010,000.$$

Find the elasticity of demand (as a function of p). If $p = 20$ and $x = 500$, with the revenue increase, decrease or stay the same if the price increases slightly?

7. Consider the learning curve model

$$f(t) = M(1 - e^{-kt}).$$

A student is given a list of 50 numbers to memorize. She is given 5 minutes to study the list, and is able to recall 15 of the numbers. Another student is given 10 minutes to study the list. How many numbers do you expect him to remember?