

A Few Extra Problems – Week #2

MATH 101 Section 205

January 14, 2007

The following are a few more challenging problems. Remember, the final exam has 2/3 of its problems of the style given in the weekly homework assignments posted on the common website, and 1/3 are potentially somewhat more challenging.

1. Use a definite integral to define a function $F(x)$ having derivative

$$\frac{\sin(x)}{1+x^2}$$

for all x and satisfying $f(17) = 0$.

2. Does the function

$$F(x) = \int_0^{2x-x^2} \cos\left(\frac{1}{1+t^2}\right) dt$$

have a maximum or minimum value? Justify your answer. (Hint: Do NOT attempt to evaluate the integral.)

3. Show that

$$\int_x^1 \frac{1}{1+t^2} dt = \int_1^{1/x} \frac{1}{1+v^2} dv.$$

4. Evaluate

$$\lim_{n \rightarrow \infty} \frac{1}{n} \left(\left(1 + \frac{1}{n}\right)^5 + \left(1 + \frac{2}{n}\right)^5 + \cdots + \left(1 + \frac{n}{n}\right)^5 \right).$$