Midterm Exam

Math 1110, July 13, 2012

NAME: INSTRUCTOR:

Problem 1. Find the indicated derivatives.

1.a) *(5 points)* Let $y(x) = x^5 + 2.5x + \pi^2$. Find $y'(x)$.

1.b) *(6 points.)* $\frac{d}{d\theta}\sin(\cos(\theta))$

1.c) *(10 points.)* Let $f(x) = 2\sin(2x) + e^{-x} + x$. Find $f^{(n)}(x)$, for $n = 1, 2, 3, 4$ and 5. (Recall $f^{(n)}$ denotes the n^{th} derivative of f.)

Problem 2. Consider the function

$$f(x) = \begin{cases} \sin(x) & \text{if } x < 0 \\ ax + b & \text{if } 0 \leq x < 1 \\ \frac{1}{2}x^2 + \frac{1}{2} & \text{if } 1 \leq x, \end{cases}$$

where a and b are real numbers.

2.a) *(8 points)* For what value of a and what value of b is f continuous at every point in its domain?

2.b) *(8 points)* For the values of a and b found in 2.a), at which values of x is f differentiable?

2.c) *(8 points)* For the values of a and b found in 2.a), write an expression for $f'(x)$ on the domain found in part 2.b)