Sample Questions for Exam 2

The following list of questions is designed to give you an idea of the difficulty level of questions that I will ask on the second midterm exam. This list is not comprehensive – there are questions I could ask that are not on here. You are responsible for all the material we have covered in this course, in class and in homework and online quizzes. But this should serve as a guide to the level of mastery I will be looking for. This list of sample questions is several questions longer than the actual test will be.

You will have fifty minutes to take this exam. You will be allowed to use a single sheet (8”x11”) of notes (both sides) and a graphing calculator during the exam. No other references will be allowed.

I will not answer further questions about what will or will not be on the exam.

1. Find coordinates of all the points on the ellipse $x^2 + 2y^2 = 16$ where the tangent line has a slope of 2.

2. Use a linear approximation of the function $f(x) = \sqrt{5 + x^2}$ at the point where $x = 2$ to estimate the value of $f(2.1)$.

3. Find all the critical points of the function $f(x) = (\cos x)(\sin x)$.

4. Use logarithmic differentiation to prove the power rule: $\frac{d}{dx} [x^a] = ax^{a-1}$ for all constant exponents $a$. (You may assume that $x$ is positive.)

5. Find a value of $b$ such that the cubic function $f(x) = x^3 + bx^2 - 8x + 3$ has a horizontal tangent line at $x = 4$.

6. Calculate $\frac{d}{dx} [\cot x]$ using the derivatives of sine and cosine.

7. Find an equation for a line that is tangent to the graph of $y = 2^x$ and that passes through the origin.

8. Find the absolute maximum value of the function $f(x) = x + \sin(2x)$ on the interval $0 \leq x \leq \pi$.

9. Let $f(x) = \frac{x}{x^2 + x + 1}$. Find the absolute maximum and absolute minimum values of $f$ on the interval $-2 \leq x \leq 0$.

10. Use a derivative sign chart to classify each critical point of $f(x) = (x^3 - 3x^2 + 5x - 5)e^x$ as either a local minimum, a local maximum, or neither.