

**Exam 2    Calc 1    10/12/2007**

Each problem is worth 10 points. For full credit provide complete justification for your answers.

1. What is the derivative of  $y = e^x + 5\tan x - 4\pi$ ?

2. a) If  $g(x) = x \cdot f(x)$ , what is  $g'(x)$ ?

b) If  $h(x) = [f(x)]^3$ , what is  $h'(x)$ ?

3. Let  $f(x) = C$ , where  $C$  is some constant. Prove that  $f'(x) = 0$ .

4. Two cars leave an intersection at the same time, with one traveling West at 45 miles per hour and the other traveling South at 60 miles per hour. How fast, to the nearest mile per hour, is the distance between the two cars changing two hours later?

5. State and prove the Product Rule for derivatives. Make it clear how you use any assumptions.

6. Why is the derivative of  $\ln x$  equal to  $1/x$ ?

7. Why is the derivative of  $\cos x$  equal to  $-\sin x$ ?

8. Bunny is a calculus student at Enormous State University, and she's having some trouble.
- "Ohmygod, I like, have no chance of even surviving calculus. It's, like, literally killing me. I thought I pretty much knew calculus from my AP class in high school, right? But, like, now it's all different stuff. We got, like, this study guide for our test? Like with 40 problems on it? And like, they say that a bunch of those will be on the test, so you have to know how to do them, right? But one of the questions is, like, whether the derivative of the absolute value of  $x$  squared plus  $x$  is equal to the absolute value of  $2x$  plus 1. But that's so unfair, because in AP we never did the absolute thingies. I think I'm going to tell Daddy and see if he can get the professor fired."

Help Bunny by explaining as clearly as possible how she might determine whether the derivative she mentions is correct (just in case her plan to get the professor fired fails).

9. Let  $g(x) = e^x \sin x$ .

a) What is  $g'(x)$ ?

b) What is  $g^{(n)}(x)$ ?

10. Find both points on the ellipse  $x^2 + 4y^2 = 36$  whose tangent lines pass through the point (12,3).

Extra Credit (5 points possible):

What is  $\lim_{x \rightarrow 0} (1+x)^{1/x}$ ?