

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

1. State the formal definition of the derivative of a function $f(x)$.

2. [WeBWork] Find an equation for the line tangent to the graph of

$$f(x) = -5xe^x$$

at the point $(a, f(a))$ for $a = 3$.

3. [WeBWorK] Let $f(x) = \frac{4}{3x+6}$. Find $f'(x)$

4. Use the definition of the derivative to find the derivative of $f(x) = \sqrt{x}$.

5. Show why the derivative of $\tan x$ is $\sec^2 x$.

6. Prove the Product Rule for derivatives.

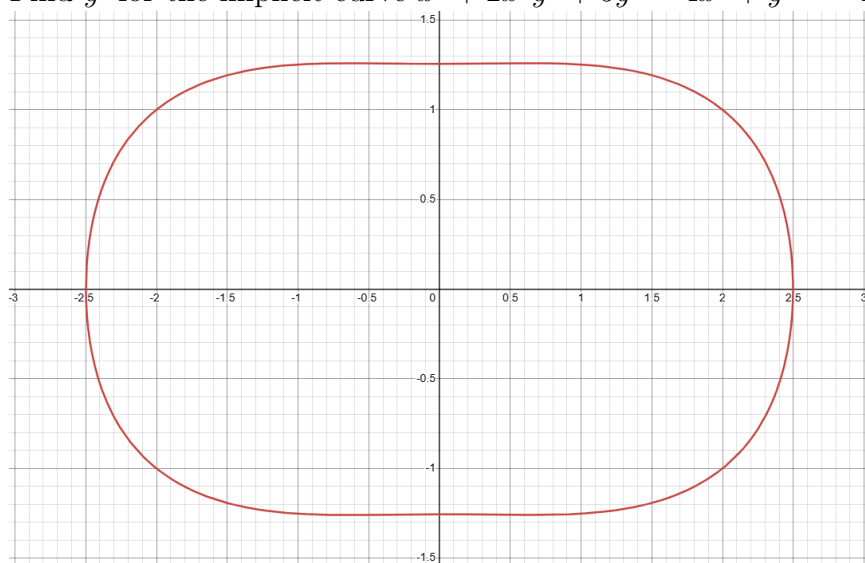
7. Biff is a calculus student at Enormous State University, and he's having some trouble with derivatives. Biff says "Dude, I think calculus is broken! Our TA said that this one problem, like with the e to x thing over x squared, right? He said that instead of doing the quotient rule thing on it, you could do it by the product rule thing. Obviously that's wacked, because what I know for sure is that in math there's just one right way to do things, right?"

Help Biff by explaining, in terms he can understand, either how there can be the two different approaches his TA mentioned, or why there can't be.

8. Show why the derivative of $\ln x$ is $1/x$.

9. Show why the derivative of $\tan^{-1} x$ is $\frac{1}{1+x^2}$.

10. (a) Find y' for the implicit curve $x^4 + 2x^2y^2 + 5y^4 - 4x^2 + y^2 = 14$.



- (b) What is the slope of the tangent line to the curve from part a at the point $(2, -1)$?

Extra Credit (5 points possible):

What's the derivative of $f(x) = x^{\sqrt{x}}$?