

Exam 2 Calc 1 10/14/2011

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

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

2. If $g(x) = \cot x + \arcsin x + \ln x + e^x + 7$, find $g'(x)$.

3. Space aliens are going to destroy planet Earth unless you can demonstrate there's intelligent life here by showing that $(\sec x)' = \sec x \tan x$. No pressure.

4. Let $h(x) = f(g(x))$ and $q(x) = f(x)/g(x)$. Use the table below to compute

a) $h'(2)$

b) $q'(3)$

x	1	2	3	4	5
$f(x)$	0	3	5	1	0
$f'(x)$	5	2	-5	-8	-10
$g(x)$	1	5	7	3	2
$g'(x)$	2	10	20	15	20

5. Use the definition of the derivative to find the derivative of $f(x) = 1/x$.

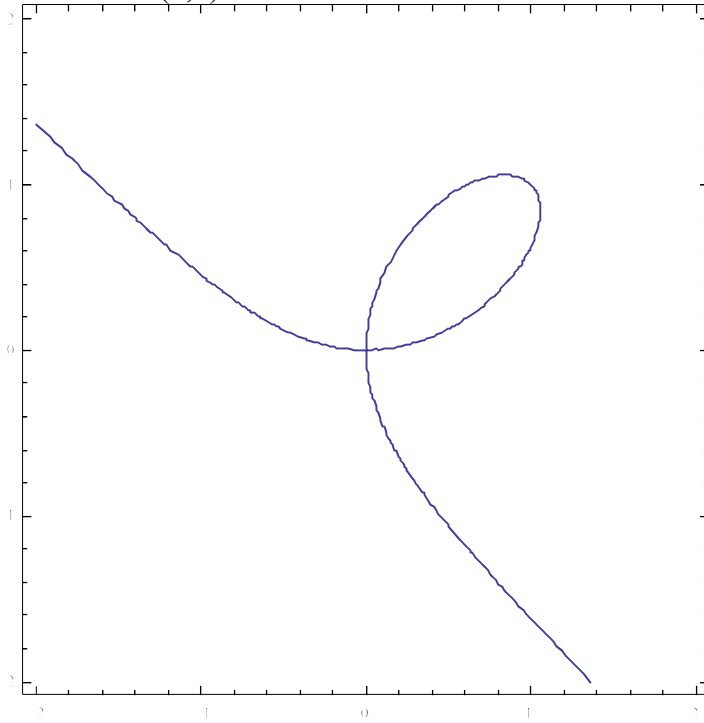
6. State and prove the Product Rule for derivatives. Make it clear how you use any assumptions.

7. What is the derivative of $\arctan x$, and why?

8. Bunny is a calculus student at Enormous State University, and she's having some trouble. Bunny says "Ohmygod. This Calculus stuff is *soooooo* confusing. First we learned Product Rule, then Quotient Rule, and then Chain Rule, and I practiced lots so I could do all of the homework on them. But then our professor said in lecture that you could always do problems just by the Product and the Chain ones, and never ever use the Quotient one. I'm so confused! Why do they even teach it then? And how does that even make sense, 'cause any time there's a fraction you have to do the Quotient, right?"

Help Bunny by explaining as clearly as you can how the Quotient Rule might be avoided with clever use of the Product and Chain Rules.

9. For the curve defined implicitly by $x^3 + y^3 = 2xy$, determine an equation for the line tangent to the curve at $(1,1)$.



10. Suppose that f is a differentiable function whose graph passes through the point $(1,4)$. If $g(x) = f(x^2)$ and the line tangent to the graph of f at $(1,4)$ is $y = 3x - 1$, determine the equation of the line tangent to the graph of g when $x = 1$. [Briggs & Cochran §3.6]

Extra Credit (5 points possible):

- a) Find the derivative of $f(x) = \frac{x^{n+1}}{n+1} \left(\ln x - \frac{1}{n+1} \right)$.
- b) Find the derivative of $g(x) = \ln \left| x + \sqrt{x^2 - a^2} \right|$.

