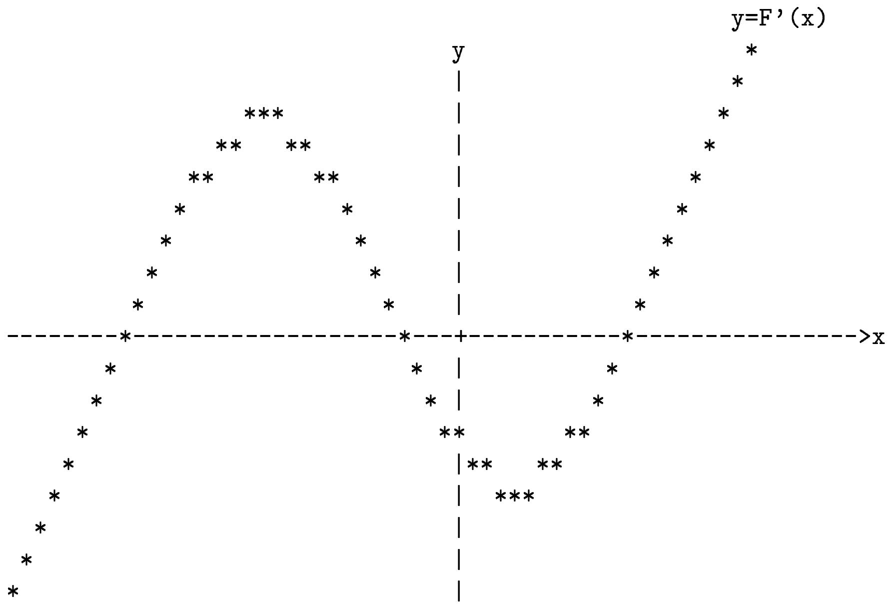
$\uparrow$name$\uparrow$ $\uparrow$ID#$\uparrow$ December 5, 2002. Show all work.

Math 75 – Fall 2002 – Hmwk #10 (psuedo-final#2) – Warren D. Smith

This homework is probably a little harder than what the real final exam (2 hours long) will be like. Feel free to use extra sheets, the real final would have a lot more white space.

1. Find derivative of these: $\sqrt{\cos(x)} + 8x^{2/7}$
2. $\ln\left(\frac{\sqrt{5x+7}}{8x+1}\right)$ [Hint. It might be a lot easier if you first use properties of logs to rewrite the problem in a different, but equivalent, way, *then* solve the problem.]
3. $\frac{x^2+7}{99x-e^{5x}}$
4. $e^{\cos x} - \tan(e^{3x})$
5. $x^e + e^x + x^x + e^e$
6. Find the numerical value of $\mathrm{d}y/\mathrm{d}x$ if $2x^3y - x^2 + y^3 = 11$, at the point $x = 1$, $y = 2$.
7. What is the equation of the tangent line (also called: linear approximation) to the curve $y = x^{1/3} + 5x^2 + \ln(3x^2+1)$ at $x = 1$? [You would not be given this **hint** on the real final, but: a method is (1) find the slope s of this curve at $x = 1$ by finding an equation for y' then substituting $x = 1$ into it, (2) find the value v of y at $x = 1$, (3) use the fact that the equation of a line with slope s passing through a point $(x = B, y = v)$ is $y_{\text{line}} = (x - B)s + v$, (4) write down this line-equation in our case! (5) perhaps try a sanity check.]
8. If the distance an object has traveled after t seconds is t^3 meters, then what is the object's speed when $t = 5$?
9. And what is its acceleration?
10. Find these limits (Answer could be "$+\infty$" or "$-\infty$" or "does not exist" incidentally.) [Show all work. Trying to estimate a numerical value with a calculator is a fine and recommended sanity check, but they will want you to show your work and methods and will give such an approach a lot less credit than if you get the *exact* answer via an *exact* method.] $\lim_{x\to 3+} \frac{14}{x-3}$
11. $\lim_{x\to 1} \frac{x^2-6x+5}{(x-1)^2}$
12. $\lim_{h\to 0} \frac{\cos(x+h)-\cos(x-h)}{2h}$
13. $\lim_{x\to 0} \frac{|x|}{x}$
14. *I* have plotted $F'(x)$. *Your* job is to plot $F(x)$, given that $F(0) = 0$. On your plot of $F(x)$, please indicate (and label as such) all its local (or global) mins, local (or global) maxes, and inflection points.



15. A triangle has legs of lengths 10 and 12 meters, and the angle between them is T.
(a) Suppose T is increasing at 1 degree per second. What is the rate of increase in the area of the triangle when $T = 60$degrees? [Warning: watch out for confusion about radians versus degrees! You may want to first solve under the assumption T is increasing at 1 *radian* per second, then ask what happens to your answer if you change 1 radian/sec to 1 degree/sec.]
(b) What is the maximum area the triangle will ever have?

16. Cobalt-60 is a radioactive isotope with a half life of 5.25 years. That is, half the Cobalt-60 atoms present in a brick at any moment will not be there 5.25 years later. How many years until only 1/10000 of the original stock of Cobalt-60 atoms remain? Express your answer as both an exact formula and as a number.

17. State TWO DIFFERENT functions $F(x)$ such that $F'(x) = 8x^2 + 17$.

18. If $F(x) = |x^2 - 9|$,
(a) what is the global min of $F(x)$ [state both the x and the $F(x)$ value] for $-4 \leq x \leq 4$?
(b) What is the global max of $F(x)$ [state both the x and the $F(x)$ value] for $-4 \leq x \leq 4$? [Hint: watch out for the effects of the absolute value signs!]