Math 1A (7:30am – 8:20am)
Quiz 4 Version B
Fri Oct 22, 2010

NAME YOU ASKED TO BE CALLED: ____________________

SCORE: ___ / 30 POINTS

NO CALCULATORS ALLOWED
SHOW PROPER WORK / USE PROPER NOTATION / SIMPLIFY YOUR ANSWERS

If $f(x) = \dfrac{2x^4 + 4x^3 + 3}{\sqrt{x}}$, find $f''(x)$.

SCORE: ___ / 3 POINTS

$f(x) = 2x^{\frac{7}{2}} + 4x^{\frac{5}{2}} + 3x^{-\frac{1}{2}}$

$f'(x) = 7x^{\frac{5}{2}} + 10x^{\frac{3}{2}} - \frac{3}{2}x^{-\frac{3}{2}}$

$f''(x) = \frac{35}{2}x^{\frac{3}{2}} + 15x^{\frac{1}{2}} + \frac{9}{4}x^{-\frac{5}{2}}$

If $f(x) = \sin x$, find $f^{(29)}(x)$. **NOTE: You do not need to show all 28 derivatives before the 29^{th} derivative, but you should show how you got your answer.**

SCORE: ___ / 3 POINTS

$f'(x) = \cos x = f^{(5)}(x) \quad \cdot \cdot \cdot \cdot \cdot \quad = f^{(29)}(x)$

$f''(x) = -\sin x = f^{(6)}(x)$

$f'''(x) = -\cos x = f^{(7)}(x)$

$f^{(4)}(x) = \sin x = f^{(8)}(x) = \cdots = f^{(28)}(x)$

$f^{(29)}(x) = \cos x$

The monthly rent on a storage unit depends on its area. If $r = f(a)$, where r is the monthly rent (in dollars), and a is the area of the storage unit (in square feet), what does the statement $f'(90) = 0.5$ mean ?
Give the units of measurement for each number in your answer.
NOTE: Your answer should NOT include "derivative", "instantaneous", "rate of change", "with respect to", "slope" or "tangent line".

SCORE: ___ / 3 POINTS

IF A STORAGE UNIT IS 90 FEET^2,
THE RENT GOES UP \$0.50 FOR EACH ADDITIONAL FEET^2 OF SPACE

Prove that if $f(x) = \cos x$, then $f'(x) = -\sin x$ using the definition of the derivative.
You may use the two limits proved in class without proving them again.

SCORE: ___ / 3 POINTS

SEE VERSION A KEY

If $f(x) = \dfrac{\sec x}{1+\cot x}$, find $f'(x)$. **SCORE: ___ / 4 POINTS**

$$f'(x) = \frac{(\sec x \tan x)(1+\cot x) - (\sec x)(-\csc^2 x)}{(1+\cot x)^2}$$

$$= \frac{\sec x(\tan x + 1 + \csc^2 x)}{(1+\cot x)^2}$$

If $f(x) = \sqrt[3]{x}\csc x$, find $f'(x)$. **SCORE: ___ / 4 POINTS**

$$f'(x) = \frac{1}{3}x^{-\frac{2}{3}}\csc x - x^{\frac{1}{3}}\csc x \cot x$$

$$= \frac{1}{3}x^{-\frac{2}{3}}\csc x(1 - 3x\cot x)$$

Let $y = \dfrac{2x+1}{x^2-x}$. **SCORE: ___ / 6 POINTS**

[a] Find $\left.\dfrac{dy}{dx}\right|_{x=2}$.

$$\frac{dy}{dx} = \frac{2(x^2-x) - (2x+1)(2x-1)}{(x^2-x)^2}$$

$$\left.\frac{dy}{dx}\right|_{x=2} = \frac{2(2)-(5)(3)}{2^2} = \frac{-11}{4}$$

[b] Find the equation of the normal line at $x = 2$.

$m = \frac{4}{11}$

WHEN $x=2$, $y = \frac{5}{2}$

$$y - \frac{5}{2} = \frac{4}{11}(x-2)$$

The table below shows values of $f(x)$ and $f'(x)$ for several values of x. **SCORE: ___ / 4 POINTS**
If $g(x) = x^3 f(x)$, find $g'(2)$.

x	-3	-2	-1	0	1	2	3
$f(x)$	2	-1	-3	-2	3	1	0
$f'(x)$	-1	3	0	-2	-3	-1	2

$$g'(x) = 3x^2 f(x) + x^3 f'(x)$$

$$g'(2) = 3(2)^2 f(2) + (2)^3 f'(2)$$

$$= 3(4)(1) + 8(-1)$$

$$= 4$$