Math 1A (9:30am – 10:20am)
Quiz 5
Thu Feb 12, 2009

SCORE: ___ / 20 POINTS

What month is your birthday ? ___ ___
What are the first 2 digits of your address ? ___ ___
What are the last 2 digits of your zip code ? ___ ___
What are the last 2 digits of your social security number ? ___ ___

NO CALCULATORS ALLOWED

[MULTIPLE CHOICE] If the position of an object at time t is given by $s(t) = e^{-at}\cos bt$, find the acceleration of the object at time $t = 0$.

SCORE: ___ / 2 POINTS

Since acceleration is the 2nd derivative of position with respect to time,
and $s''(t) = (a^2 - b^2)e^{-at}\cos bt + 2abe^{-at}\sin bt$, therefore the answer is $a^2 - b^2$

Find the following derivatives. **Simplify by factoring where appropriate.**

SCORE: ___ / 18 POINTS

½ point for each item marked in yellow
¼ point for each item marked in grey
1 point for each simplified answer

[a] If $f(x) = 3^{x^2}\sec^2 x$, find $f'(x)$.

½ ½ ½ ¼ ¼ ¼ ½ ½

$$f'(x) = 3^{x^2}(\ln 3)(2x)\sec^2 x + 3^{x^2}(2\sec x)(\sec x\tan x)$$
$$f'(x) = (2\cdot 3^{x^2}\sec^2 x)[(\ln 3)x + \tan x]$$

↳ 1 point for final simplification

TOTAL FOR THIS PART: 4¼ POINTS

[b] If $f(x) = \cot^2(\cos x)$, find $f'(x)$.

½ ½ ½

$$f'(x) = 2\cot(\cos x)(-\csc^2(\cos x))(-\sin x)$$
$$f'(x) = 2\cot(\cos x)\csc^2(\cos x)\sin x$$

↳ 1 point for final simplification

TOTAL FOR THIS PART: 2½ POINTS

[c] If $f(x) = \dfrac{e^{\sin x}}{3 - \tan x}$, find $f'(x)$.

½ ½ ¼ ¼ ¼ ½ **½ for denominator**

$$f'(x) = \frac{e^{\sin x}(\cos x)(3 - \tan x) - e^{\sin x}(-\sec^2 x)}{(3 - \tan x)^2}$$
$$f'(x) = \frac{e^{\sin x}(3\cos x - \sin x + \sec^2 x)}{(3 - \tan x)^2}$$

↳ 1 point for final simplification

TOTAL FOR THIS PART: 3¾ POINTS

[d] If $f(x) = x^3 + 2x$, and $g(x) = f^{-1}(x)$, find $g'(12)$.

½ ½

$$f(2) = 12 \quad so \quad g'(12) = \frac{1}{f'(2)}$$
$$f'(x) = 3x^2 + 2 \quad so \quad g'(12) = \frac{1}{3(2)^2 + 2} = \frac{1}{14}$$

↑ ½ ↑ ½

TOTAL FOR THIS PART: 2 POINTS

[e] If $f(x) = x^2 e^{-x}\csc 3x$, find $f'(x)$.

½ ¼ ¼ ¼ ¼ ½ ½ ¼ ¼ ¼ ¼ ½ ½

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

↳ 1 point for final simplification

TOTAL FOR THIS PART: 5½ POINTS