

MATH 2250

Midterm Exam I

February 16, 2012

NAME (please print legibly): _____

Your University ID Number: _____

Please complete all questions in the space provided. You may use the backs of the pages for extra space, or ask me for more paper if needed. This exam will be graded on:

- Correctness of computations.
- Clarity of explanation of procedure.
- Correctness of procedure.

A correct answer obtained using an incorrect or poorly explained procedure will not be graded for full credit. Please feel free to write as much as you like. Work carefully, and try to complete the problems you find easier before going back to the harder ones. Good luck!

QUESTION	VALUE	SCORE
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	20	
TOTAL	110	

1. (10 points) Find the derivative

$$\frac{d}{dx}(x^2 + 3x + 5)^{78}$$

ANSWER: _____

2. (10 points) Find the derivative

$$\frac{d}{dx} \frac{3x + \tan x}{e^x}$$

ANSWER: _____

3. (10 points) Find the derivative

$$\frac{d}{dx} \sec x \ln x.$$

ANSWER: _____

4. (10 points) Find the derivative

$$\frac{d}{dx} \arccos(7x^2 + 41).$$

ANSWER: _____

5. (10 points) Find the derivative

$$\frac{d}{dx}(256)^{x^2+3}$$

ANSWER: _____

6. (10 points) Find the first four derivatives of

$$f(x) = \sin(x).$$

That is, find $f'(x)$, $f''(x)$ (the derivative of $f'(x)$), $f'''(x)$ (the derivative of $f''(x)$) and $f''''(x)$ (the derivative of $f'''(x)$).

ANSWER: _____

7. (10 points) Show that the derivative $f'(x)$ of

$$f(x) = \arctan(x) + \arctan\left(\frac{1}{x}\right)$$

is equal to zero. In this case, you *do* have to simplify the derivatives.

ANSWER: _____

8. (10 points) (Position, Velocity, and Acceleration) The position of a rollercoaster along its' track is given by $p(t) = 4t \cos t$ (meters), where t is measured in seconds. Find the acceleration of the rollercoaster in (meters)/(sec)² at time $t = 4$ (sec) .

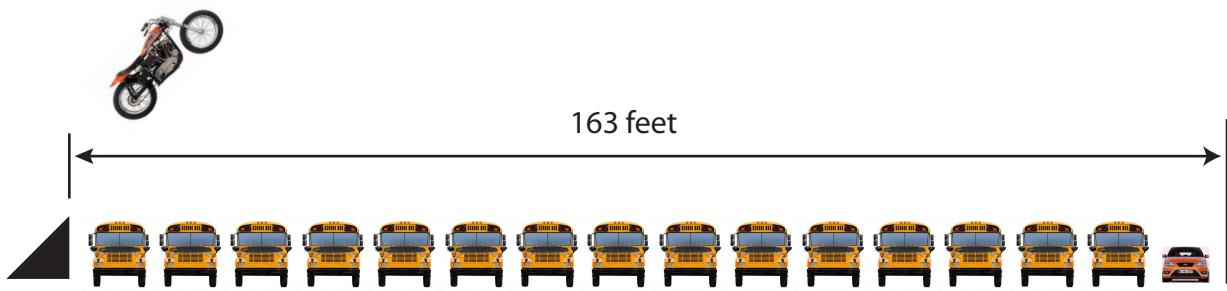
ANSWER: _____

9. (10 points) (Projectile Motion) Homer Simpson is shot vertically from a cannon at 28 m/s. When does Homer's vertical velocity equal zero? At what height (above his starting position) is Homer when this happens? Recall that $g = -9.8 \text{ m/s}^2$.

ANSWER: _____

10. (20 points) (Projectile Motion) The world record for jumping buses on an Harley Davidson XR-750 is 15 buses (157 feet), set by Bubba Blackwell in 1999. (See, you've already learned something today!) Hairy Dawg plans to attempt to exceed Bubba's record on July 4, 2012 by jumping over 15 buses and one Ford Focus, a total jump of 163 feet. Hairy will launch his Harley XR-750 from a ramp set to 45 degrees. How fast must Hairy be driving (in feet per second) when he leaves the ramp? Bonus: Convert Hairy's speed to mph.

Helpful hints: You may assume that $g = -32 \frac{\text{ft}}{\text{sec}^2}$. If Hairy leaves the ramp at velocity v , his vertical velocity and horizontal velocity will both be equal to $v\sqrt{2}/2$.



(Please continue with problem 10 on this page.)

(Please continue with problem 10 on this page.)

ANSWER: _____