

Name:
Score:

Math 441
Test 2

Read all directions and answer the questions the best that you can. Reasonable work is expected to be shown for all problems.

Part 1 (5 points each)

Find the derivative for the following functions. You do not have to simplify your answer.

1.) $a(x) = 9x^{4/3} - 6x^{-4} + 3 \sec x - 4 \tan x$

2.) $b(x) = \sqrt[7]{x^5} + \frac{7}{x^2}$

3.) $c(x) = (2x^3 + 5x)^2$

4.) $d(x) = \frac{x^2 \sin x}{\cos x}$

5.) $e(x) = \sin(\tan(4x)) - \csc(x^2)$

Part 2 (7 points each)

Answer the following questions. Reasonable work is expected.

1.) Find the equation of the line tangent to $g(x) = \sqrt{x} - \frac{8}{x} + 2x - 12$ at $x = 4$

2.) Find the equation of the line tangent to $h(x) = 4 \cos(2x) - 8 \sin x + 5$ at $x = \frac{\pi}{6}$

3.) Where does $j(x) = 3x^4 - 6x^2 + 10$ have horizontal tangent lines?

4.) Where does $k(x) = \frac{x^2}{x-4}$ have horizontal tangent lines?

Part 3 (4 points each)

Evaluate the following limits.

1) $\lim_{x \rightarrow 0} \frac{\sin(7x)}{\sin(2x)}$

2) $\lim_{x \rightarrow 0} \frac{\tan(9x)}{4x}$

Part 4 (18 total points)

Given an object moves only left/right with its position given by $s(t) = \frac{1}{3}t^3 - 3t^2 + 5t$ where s is in feet and t is in seconds. Use this to answer all of the following questions.

1.) (7 points) Give equations that measure the object's velocity and acceleration. What units would go with the object's velocity? What units would go with the object's acceleration?

2.) (5 points) At what time(s) does this object come to rest?

3.) (6 points) Which direction is the object moving after 2 seconds have passed? Is the object speeding up or slowing down at that moment?

Part 5 (7 points each)

Answer the following questions.

1.) Find $\frac{d^2y}{dx^2}$ for $y^2 - x^3 + 4x = 10y - 12$

2.) Find $\frac{dy}{dt}$ for $x^2 + 6y^3 + 2 = 4y + 2x$ at the point $(2, -1)$ given $\frac{dx}{dt} = -2$

3.) Jack lets go of a balloon and it rises at a rate of 1 ft/sec. Two seconds after he lets go of the balloon, Jack starts to walk away at a rate of 4 ft/sec. After 5 total seconds have passed (starting from when Jack let go of the balloon), at what rate is the distance between Jack and the balloon changing?