Name: _____   Date: _____

QUIZ

Applications of the Derivative:

Functions 2: Critical Points - Ladder Problem

Problem Solving

Directions:

You have 20 minutes to find the solution. Use the "Derivative Concept", its formal definition, apply rules to find derivatives, and apply differential methods to differentiate.

When Trigonometry, differentiate, find derivatives, and/or sketch the graph of the function f (x). Analyze the Graph when appropriate.

Pay close attention to the given Hints.

Grade: _____

Teacher's Signature: _____

1. <u>Apply "Tangent and Normal Lines" Concept.</u>

    Find the equation of the tangent line to the graph of

    $$f(x) = \sqrt{x^2 + 3}$$ at the point (-1, 2)

<u>Hint:</u>

The derivative of a function at a point is the slope of a tangent line at this point. The normal line is defined as the line that is perpendicular to the tangent line at the point of tangency.

The slopes of perpendicular lines are negative reciprocals of one another.

2.   Find all the critical points of

$$f(x) = x^4 - 8x^2$$

Hint:

Calculate the derivative,
Apply factorization (Algebra I),
Apply binomial functions (Algebra I),
Apply the Critical Points concept in calculus (when the first derivative $= 0$)

3. Find all critical points of

$$f(x) = \sin(x) + \cos(x) \qquad \text{on the interval } (0, \ 2\pi \ )$$

<u>Hint:</u>

Calculate the derivative,
Apply the Critical Points concept in calculus (when the first derivative =
0),
Apply Algebra I concepts,
Draw the funcions and calculate the value of x in the given interval.

4. Using Triangles and the Pythagorean Theorem

Problem:
A ladder 10 feet long rest against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1ft/sec, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6ft from the wall?

Hint:

o First draw a diagram and label it (i.e., ground, wall, ladder).
o It is given dx/dt=1, and we are asked for dy/dt when x=6. Draw another diagram representing that "rate of change".
o Apply the Pythagoream Theorem for   x^2 + y^2 = 10^2
o Differentiate each side.
o Solve the equation dy/dt.