Honors Calculus AB Name_____

Final Exam: Open Response 5/5/2003

Answer 3 of the following 5 open response questions. Make sure to write complete solutions to your problems in order to receive partial credit. Each of the 3 questions you answer will be weighted equally. List the 3 problems you want graded on the lines below. Good luck!

I would like problems _____ , _____ , and _____ graded.

Honors Calculus AB Name_____

Final Exam: Open Response 5/5/2003

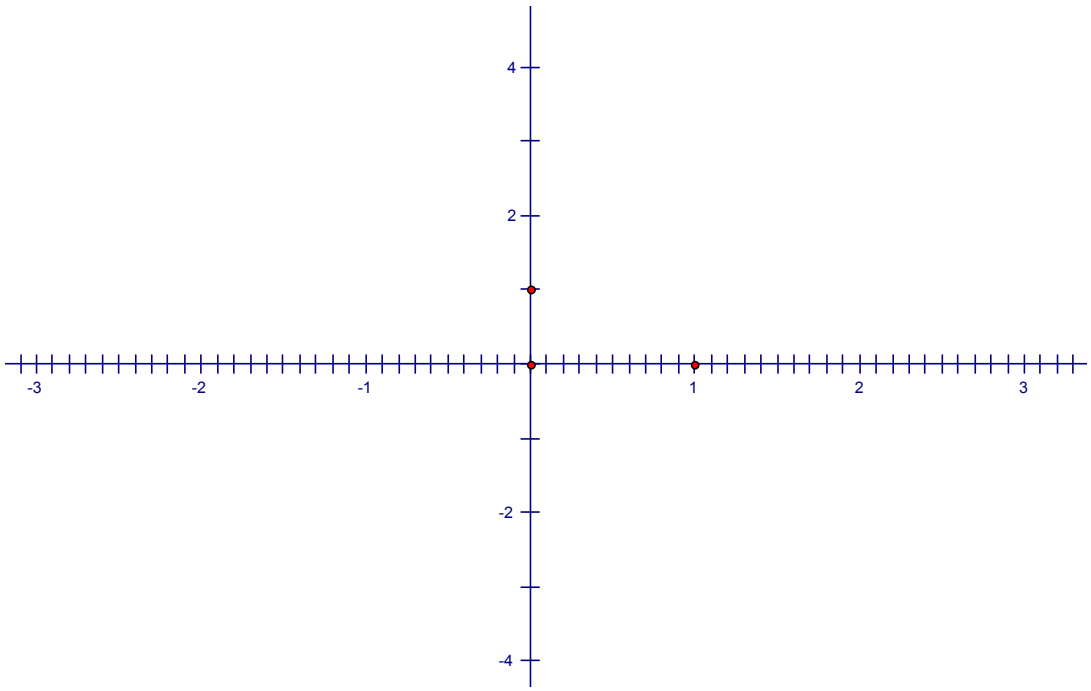
1. Let R denote the region bounded by the x-axis, $x = 2$, and the curve $y = x^2$.

a) Draw the region R on the axes provided below.

b) Find the area of region R

c) Find the volume of the solid formed when region R is revolved <u>around the x-axis</u>.

d) Find the volume of the solid formed when the region R is revolved <u>around the y-axis</u>.



Honors Calculus AB Name_____

Final Exam: Open Response 5/5/2003

2. A particle travels along the x-axis with acceleration $a(t) = -4t$. Initially, time $t = 0$, the particle is located at the origin and has velocity –4 units/second.

a) Find the velocity *v(t)* and position *s(t)* functions.
b) What is the maximum *speed* of the particle over the interval [0,3] and at what time does it occur?
c) What is the total distance the particle travels in the first 3 seconds of its motion?

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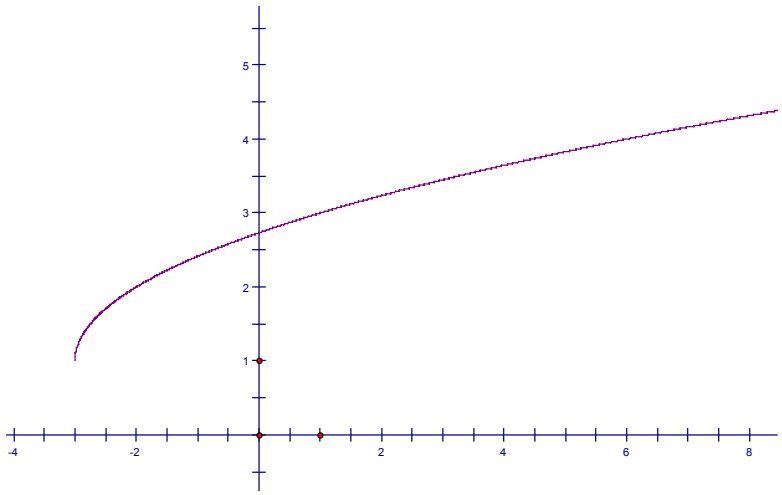
3. Let $f(x) = 1 + \sqrt{x+3}$.

a) Find the *average* rate of change of *f* on the interval [-3,1].
b) Find an *x*-value, *c*, such that the *instantaneous* rate of change at *c* is equal to the *average* rate of change on the interval [-3,1].
c) Find the equation of the line tangent to *f* that passes through *c*.
d) Parts a-c of this problem relate to the *Mean Value Theorem*. State this theorem and illustrate its geometric meaning on the graph of the function provided below.



Honors Calculus AB Name_____

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4. Given the curve $f(x) = -(x-3)^2 + 4$

   a) Find the average value of the function over the interval [1,4].
   b) Use calculus to explain why in the interval [2,4] there must exist an x-value, c, such that $f'(c) = 0$.
   c) Use calculus to explain why in the interval [3,6] the graph of the function f must cross the x-axis <u>exactly</u> once.

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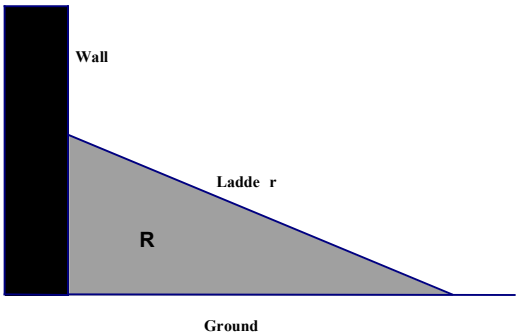
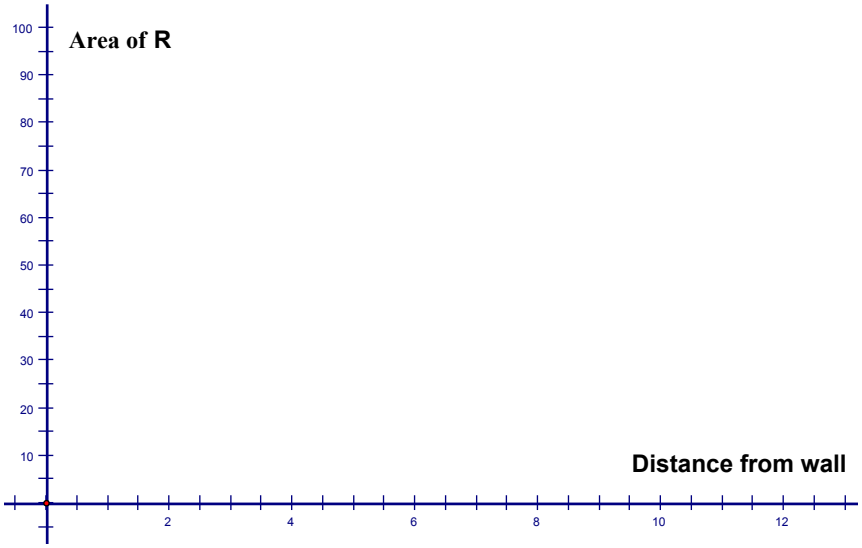
5. A 13-foot ladder is leaning against a house when its base starts to slide away. By the time the base is 12 feet from the house, the base is moving at the rate of 5 ft/sec.

   a) How fast is the top of the ladder sliding down the wall at that moment when the base is 12 feet from the house?



   (b) At what rate is the area of the triangular region **R** changing at that moment?

   (c) Make an accurate graph of *Area of* **R** versus *Distance from wall* for distances between 0 and 13 feet.



   (d) Where is the area of **R** greatest? Justify your response.