

Written Homework 9

MATH 2200-98 ILSB Calculus 1

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Organization is essential on this assignment. Messy work will not be graded and boxed answers will be ignored.

For Problems 1 through 5: you are required to use GASCAP to layout your work.

1. If 1200 cm^2 of material is available to make a box with a square base and an open top, find the largest possible volume of the box.

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2. Find the point on the curve $y = \sqrt{x}$ that is closest to the point $(3, 0)$. Report your final result in exact form.

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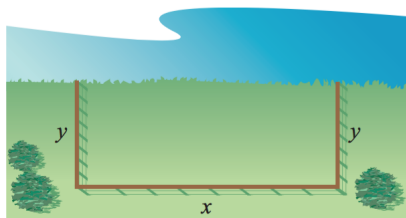
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3. The sum of two numbers is 16. What is the smallest possible value of the sum of their squares?

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4. A farmer plans to fence a rectangular pasture adjacent to a river (see figure).



The pasture must contain 245,000 square meters in order to provide enough grass for the herd. What dimensions will require the least amount of fencing if no fencing is needed along the river?

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5. A Norman window is pictured below.

This type of window has the shape of a rectangle surmounted by a semicircle. If the perimeter of the window is 30 ft, find the dimensions of the window so that the greatest possible amount of light is admitted. Round your final results to two decimal places.



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6. Use a linear approximation or differentials to estimate the number $\sqrt[3]{1001}$. Round your final result to 3 decimal places.

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7. Consider the function $f(x) = \frac{x}{x+1}$.

- (a) Determine the equation of the line $L(x)$ that represents the linear approximation to $f(x)$ for $a = 1$.

- (b) Use this approximation to find the value $f(1.1)$. Round your final result to 3 decimal places.

- (c) Compute the percent error in your approximation assuming that the exact value is given by your calculator. Round your final result to 3 decimal places. Recall that percent error is given by

$$\text{Percent Error} = 100 \cdot \frac{|\text{Approximation} - \text{Exact}|}{|\text{Exact}|}$$

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8. The circumference of a sphere was measured to be 84 cm with a possible error of 0.5 cm. Use differentials to estimate the maximum error in the calculated surface area. What is the relative error? Round your final result to 2 decimal places.

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9. The circumference of a sphere was measured to be 84 cm with a possible error of 0.5 cm. Use differentials to estimate the maximum error in the calculated volume. What is the relative error? Round your final result to 2 decimal places.

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10. Approximate the change in the atmospheric pressure when the altitude increases from $z = 2$ km to $z = 2.01$ km where $P(z) = 1000e^{-z/10}$. Round your final result to 3 decimal places.