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For each of the following functions, express dy in terms of x and dx.

1. $y = (3x + 5)^6$

$dy =$ _____

2. $y = \sqrt[3]{3x - 1}$

$dy =$ _____

3. $y = \sin(2x^2 + 1)$

$dy =$ _____

4. $y = \csc(1 - x^3)$

$dy =$ _____

Use differentials to find a rational approximation for each of the following irrational numbers. Show your work neatly organized in the space provided.

5. $\sqrt{25.1} \approx$

6. $\sqrt[3]{7.5} \approx$

Use differentials to approximate the answer to the following question. Show your complete solution neatly organized in the space provided.

7. A iron ball with a radius of 2 inches is given a nickel plating that is 0.1 inches thick. What is the volume of nickel used? For a sphere, $V = (4/3)\pi r^3$.

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Use differentials to approximate the answer to the following question. Show your complete solution neatly organized in the space provided.

8. A steel cube measuring 10 inches on each edge is given a copper plating that is 1/16 inches thick. What is the volume of copper used?

Use calculus to solve the following problem. Show your complete solution neatly organized. Express any irrational answer rounded to 3 significant digits.

9. Find the least and the greatest straight line distance between the ellipse $25x^2 + 9y^2 = 225$ and the point (4, 0).

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Use calculus to solve the following problem. Show your complete solution neatly organized. Express any irrational answer rounded to 3 significant digits.

10. A messenger is to go ashore from a ship that is 8 miles offshore and deliver a message to a camp that is 12 miles up the beach from the point nearest the ship. He can go 8 mph by boat and will be met by a jeep that can go 16 mph over the beach. If he left the ship at precisely 10:00 AM, then what is the earliest time that he can arrive at the camp?

11. Each of the two equal sides of an isosceles triangle is k inches long. Use calculus to show that the maximum area of the triangle is $0.5k^2$ square inches.