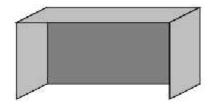
AP Calculus

TEST: 3.6 to 3.8, Calculator Permitted

- _____ 1. If the radius and the height of a right circular cone both increase at a constant rate of $\frac{1}{2}$ centimeters per second, at what rate, in cubic centimeters per second, is the volume increasing when the height is 9 centimeters and the radius is 6 centimeters?
 - (A) $\frac{f}{2}$
- (B) 10f (C) 24f (D) 54f
- (E) 108f
- 2. A canvas wind shelter like the one at right is to be built for use along parts of the Guadalupe River. It is to have a back, two square sides, and a top. If $\frac{147}{2}$ square feet of canvas is to be used in the construction, find the depth of the shelter for which the space inside is maximized assuming all the canvas is used.



- (A) depth = $\frac{7}{2}$ feet (B) depth = $\frac{7}{4}$ feet (C) depth = 4 feet (D) depth = 7 feet

- (E) none of these
- _____ 3. A rectangle has one side on the *x*-axis and the upper two vertices on the graph of $y = e^{-2x^2}$. Give a decimal approximation for the maximum possible area for this rectangle.
 - (A) 1.649
- (B) 1
- (C) 2.031
- (D) 0.545
- (E) 0.606
- 4. The *derivative* of $f(x) = \frac{x^4}{3} \frac{x^5}{5}$ attains its maximum value at $x = \frac{x^4}{5} + \frac{x^5}{5}$
 - (A) -1 B) 0
- (C) 1
- (D) $\frac{4}{3}$
- 5. A baseball diamond is a square with side 90 feet. If a batter hits the ball and runs towards first base with a speed of 25 ft/sec, at what speed is his distance from second base decreasing when he is two thirds of the way to first base?
- (A) $\frac{5}{2}\sqrt{10}$ ft/sec (B) $\frac{3}{2}\sqrt{10}$ ft/sec (C) $4\sqrt{5}$ ft/sec (D) $2\sqrt{10}$ ft/sec (E) $3\sqrt{5}$ ft/sec

- 6. The approximate value of $f(x) = \sqrt{4 + \sin x}$ at x = 0.12, obtained from the equation of the tangent line to the graph of f(x) at x = 0 is
 - (A) 2.00
- (B) 2.03
- (C) 2.06
- (D) 2.12
- (E) 2.24

- Part II: Free Response. Do all work below the line. Label each part. Notation, Notation, Notation. Include units in ALL of your final answers.
- 10. Coffee is draining from a conical filter into a cylindrical coffeepot at the rate of $10 \text{ in}^3 / \text{min}$. The dimensions of the filter and coffeepot are indicated in the diagram at right. Note: 6'' = 6 inches.
 - (a) Using similar triangles, find an equation relating the height,
 h, of the coffee in the cone in terms of the radius, r, of the coffee in the cone.
 - (b) Write a simplified equation for the volume, V, of the coffee in the cone in terms of the height, h, of coffee in the cone. (get rid of the r variable!)
 - (c) How much coffee, in cubic inches, is in the cone when the coffee in the cone is 5 inches deep?
 - (d) How fast is the level, **h**, in the cone falling when the coffee in the cone is 5 inches deep?
 - (e) How fast is the depth level, y, in the pot rising when the coffee in the cone is 5 inches deep?
 - (f) Do you prefer hot coffee or iced coffee? Precalculus or Calculus?

