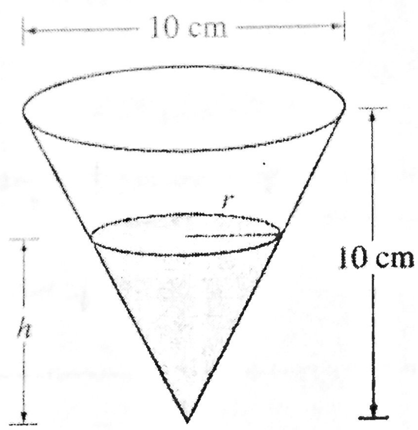
# AP® CALCULUS AB 2002 SCORING GUIDELINES

## Question 5




A container has the shape of an open right circular cone, as shown in the figure above. The height of the container is 10 cm and the diameter of the opening is 10 cm. Water in the container is evaporating so that its depth $h$ is changing at the constant rate of $\frac{-3}{10}$ cm/hr.

(The volume of a cone of height $h$ and radius $r$ is given by $V = \frac{1}{3}\pi r^2 h$.)

(a) Find the volume $V$ of water in the container when $h = 5$ cm. Indicate units of measure.

(b) Find the rate of change of the volume of water in the container, with respect to time, when $h = 5$ cm. Indicate units of measure.

(c) Show that the rate of change of the volume of water in the container due to evaporation is directly proportional to the exposed surface area of the water. What is the constant of proportionality?

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## 2000 GRADING STANDARDS

AP Calculus AB–5 / BC–5 (NO CALCULATOR!) 2000

Consider the curve given by $xy^2 - x^3y = 6$.

(a) Show that $\dfrac{dy}{dx} = \dfrac{3x^2y - y^2}{2xy - x^3}$.

(b) Find all points on the curve whose $x$-coordinate is 1, and write an equation for the tangent line at each of these points.

(c) Find the $x$-coordinate of each point on the curve where the tangent line is vertical.