



AP[®] Calculus BC

2003 Sample Student Responses

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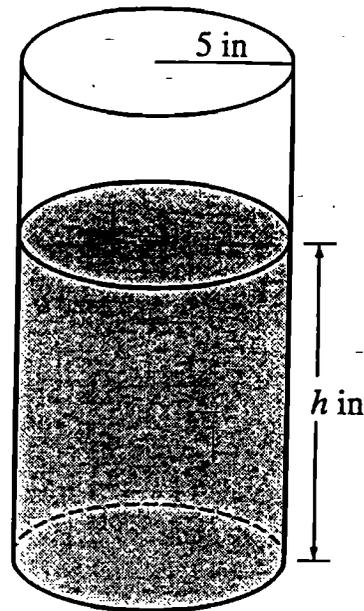
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NO CALCULATOR ALLOWED



Work for problem 5(a)

$$V = \pi r^2 h$$

$$\frac{dV}{dt} = -5\pi\sqrt{h} = \pi 25 \frac{dh}{dt}$$

$$\frac{-5\sqrt{h}}{25} = 25 \frac{dh}{dt} \div 25$$

$$-\frac{\sqrt{h}}{5} = \frac{dh}{dt}$$

Continue problem 5 on page 13.

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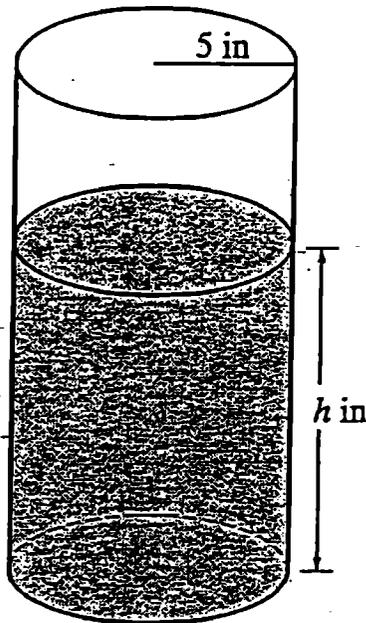
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-h = depth in inches

$$\frac{dV}{dt} = -5\pi\sqrt{h} \text{ in}^3/\text{s}$$

$$V = \pi r^2 h$$

$$V = \pi(25)h$$

Work for problem 5(a)

$$-\frac{dh}{dt} = -\frac{\sqrt{h}}{5}$$

$$\frac{dV}{dt} = 5\pi\sqrt{h}$$

$$V = \pi r^2 h \quad r = 5$$

$$V = 25\pi h$$

$$\frac{dV}{dt} = 25\pi \frac{dh}{dt}$$

$$\frac{5\pi\sqrt{h}}{5\pi} = \frac{25\pi}{25\pi} \cdot \frac{dh}{dt}$$

$$\boxed{\frac{\sqrt{h}}{5} = \frac{dh}{dt}}$$

Continue problem 5 on page 13.

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Work for problem 5(b)

$$\cancel{dt} \cdot \frac{dh}{dt} = \frac{-\sqrt{h}}{5} \cdot dt$$

$$\frac{1}{\sqrt{h}} \cdot dh = \frac{-\sqrt{h}}{5} \cdot dt \cdot \frac{1}{\sqrt{h}}$$

$$\int h^{-1/2} dh = \int -\frac{1}{5} dt$$

$$2h^{1/2} = -\frac{1}{5}t + C$$

$$2\sqrt{h} = -\frac{1}{5}t + C \quad h=17 \text{ at time } t=0$$

$$2\sqrt{17} = -\frac{1}{5}(0) + C$$

$$C = 2\sqrt{17}$$

$$\frac{2\sqrt{h}}{2} = \frac{-\frac{1}{5}t + 2\sqrt{17}}{2}$$

$$(\sqrt{h})^2 = \left(\frac{t}{10} + \sqrt{17}\right)^2$$

$$h = \left(\frac{t}{10} + \sqrt{17}\right)^2$$

Work for problem 5(c)

$$V=0 = 2t\sqrt{h}$$

$$h=0$$

$$0 = \left(\frac{t}{10} + \sqrt{17}\right)^2$$

$$0 = \frac{t}{10} + \sqrt{17}$$

$$-10 - \sqrt{17} = \frac{t}{10} \cdot 10$$

$$t = 10\sqrt{17} \text{ seconds}$$

GO ON TO THE NEXT PAGE.