



AP[®] Calculus AB 2003 Sample Student Responses

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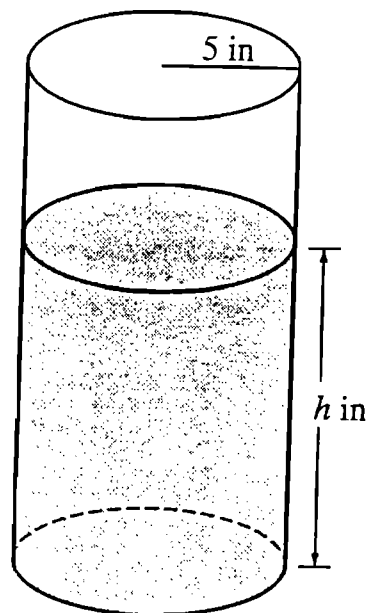
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NO CALCULATOR ALLOWED



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.

NO CALCULATOR ALLOWED

Work for problem 5(b)

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

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

$$2h^{1/2} + C_1 = -\frac{1}{5}t + C_2$$

$$2\sqrt{h} = -\frac{1}{5}t + C_3$$

$$2\sqrt{17} = -\frac{1}{5}(0) + C_3$$

$$C_3 = 2\sqrt{17}$$

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

$$\sqrt{h} = -\frac{t}{10} + \sqrt{17}$$

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

Work for problem 5(c)

$$h = 0$$

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

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

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

~~$$\begin{aligned} 0 &= \frac{t^2}{100} + \frac{2\sqrt{17}t}{10} + 17 \\ \frac{t^2}{100} + \frac{2\sqrt{17}t}{10} + 17 &= 0 \\ \frac{t^2}{100} + \frac{2\sqrt{17}t}{10} + 17 &= 0 \\ \frac{t^2}{100} + \frac{2\sqrt{17}t}{10} + 17 &= 0 \end{aligned}$$~~

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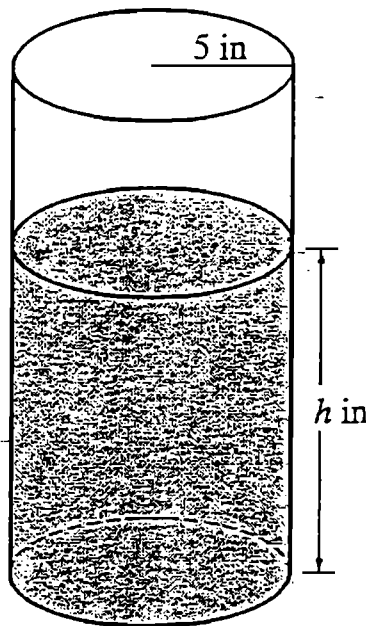
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y,

NO CALCULATOR ALLOWED



-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)

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

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

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

$$V = 25\pi h$$

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

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

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

Continue problem 5 on page 13.

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y₂

NO CALCULATOR ALLOWED

Work for problem 5(b)

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

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

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

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

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

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

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

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

$$(\sqrt{h})^2 = \left(\frac{1}{10}t + \sqrt{17}\right)^2$$

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

Work for problem 5(c)

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

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

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

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

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

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