



AP[®] Calculus AB 2002 Sample Student Responses Form B

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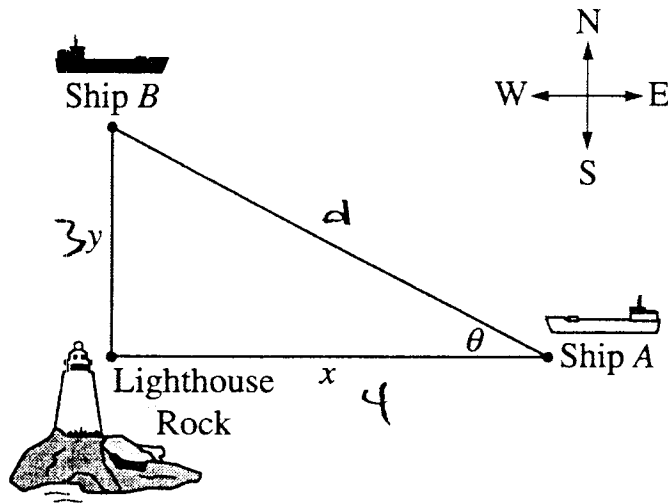
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NO CALCULATOR ALLOWED

B1



Work for problem 6(a)

$$\begin{aligned}
 d &= \sqrt{x^2 + y^2} \\
 &= \sqrt{16 + 9} \\
 &= \sqrt{25} \\
 &= 5 \text{ km}
 \end{aligned}$$

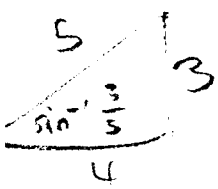
Work for problem 6(b)

$$\begin{aligned}
 d^2 &= x^2 + y^2 \\
 2d \frac{dd}{dt} &= 2x \frac{dx}{dt} + 2y \frac{dy}{dt} \\
 (10) \frac{dd}{dt} &= (8)(-15) + (6)(10) \\
 \frac{dd}{dt} &= \frac{-120 + 60}{10} \\
 &= -6 \text{ km/h}
 \end{aligned}$$

Work for problem 6(c)

$$\sin \theta = \frac{3}{5}$$

$$\theta = \sin^{-1}\left(\frac{3}{5}\right)$$



$$y = d \sin \theta$$

$$\frac{dy}{dt} = d \cos \theta \frac{d\theta}{dt} + \frac{dd}{dt} \sin \theta$$

$$10 = (5) \cos \theta \frac{d\theta}{dt} + (-6) \sin \theta$$

$$= 5 \cos \left[\sin^{-1} \frac{3}{5} \right] \frac{d\theta}{dt} + (-6) \sin \left[\sin^{-1} \frac{3}{5} \right]$$

$$= \cancel{5} \left(\frac{4}{\cancel{5}} \right) \frac{d\theta}{dt} - 6 \left(\frac{3}{5} \right)$$

$$= 4 \frac{d\theta}{dt} - \frac{18}{5}$$

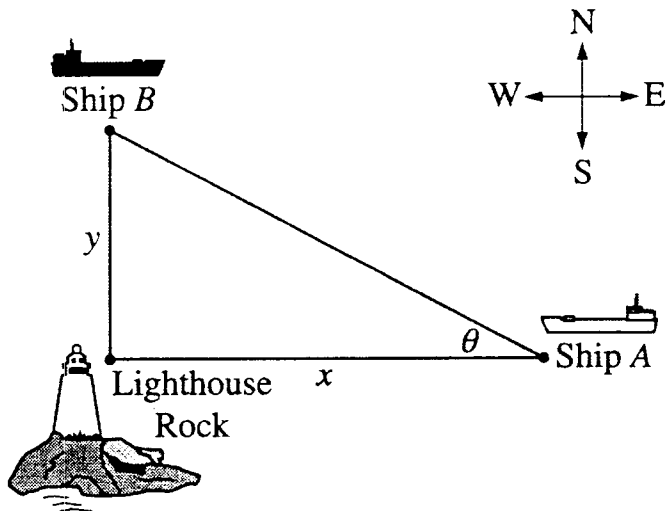
$$\frac{d\theta}{dt} = \frac{50 + 18}{5} \cdot \frac{1}{4}$$

$$\frac{d\theta}{dt} = \frac{68}{20}$$

$$= \frac{17}{5} \text{ rad/hour}$$

NO CALCULATOR ALLOWED

C₁



Work for problem 6(a)

$$x^2 + y^2 = z^2$$

$$(4)^2 + (3)^2 = z^2$$

$$16 + 9 = z^2$$

$$25 = z^2$$

$$5 = z$$

5 km away

Work for problem 6(b)

$$x^2 + y^2 = z^2$$

$$2x \left(\frac{dx}{dt} \right) + 2y \left(\frac{dy}{dt} \right) = 2z \left(\frac{dz}{dt} \right)$$

$$2(4)(15) + 2(3)(10) = 2(5) \left(\frac{dz}{dt} \right)$$

$$120 + 60 = 10 \frac{dz}{dt}$$

$$\frac{180}{10} = \frac{dz}{dt}$$

18 km/hr

NO CALCULATOR ALLOWED

Work for problem 6(c)

$$\tan \theta = \frac{y}{x}$$

$$\sec^2 \theta \left(\frac{d\theta}{dt} \right) = \frac{x \left(\frac{dy}{dt} \right) - (y) \left(\frac{dx}{dt} \right)}{x^2}$$

$$\sec^2 \theta \left(\frac{d\theta}{dt} \right) = \frac{4(15) - (3)(10)}{4^2}$$

$$= \frac{60 - 30}{16}$$

$$= \frac{30}{16}$$

$$\frac{d\theta}{dt} = \frac{30}{16 \sec^2 \theta} \frac{\text{radians}}{\text{hour}}$$

$$\tan^{-1} \theta = \frac{3}{4}$$

C2

$$\frac{d\theta}{dt} = \frac{30}{16 \sec^2 \theta}$$

$$\tan \frac{\pi}{3} = \theta$$

