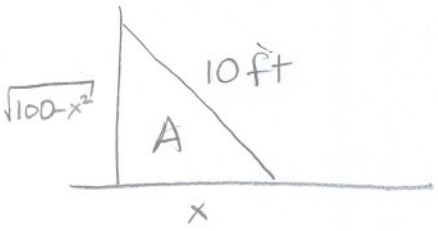
Math 1A (7:30am – 8:20am)
Group Quiz 9
Wed Dec 3, 2008

Group Members' Names: _____

SCORE: ___ / 10 POINTS

NO CALCULATORS ALLOWED

A 10 foot ladder rests against a wall. The base of the ladder is pulled away from the wall at a rate of 2 feet per minute. How quickly is the area between the ladder, the wall and the ground changing when the ladder is 4 feet from the wall ? **Give correct units for your answer.** SCORE: ___ / 5 POINTS



NOTE: UNITS $\sqrt{100\,ft^2 - x^2}$, 4 ft, $\frac{2\,ft}{min}$

$\frac{1}{2}$ $\frac{dx}{dt} = \frac{2\,ft}{min}$ WANT $\frac{dA}{dt}\Big|_{x=4\,ft}$ $\frac{1}{2}$

$A = \frac{1}{2} \times \sqrt{100-x^2}$ 1

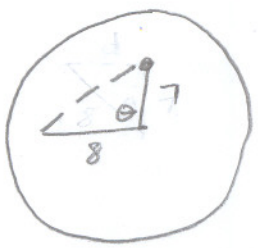
$\frac{dA}{dt} = \frac{1}{2}\left(\frac{dx}{dt}\right)\sqrt{100-x^2} + \frac{1}{2}x\left(\frac{1}{2}(100-x^2)^{-\frac{1}{2}}\right)(-2x)\frac{dx}{dt}$ 1

$= \frac{1}{2}(2)\left(\sqrt{100-16}\right) + \frac{1}{2}(4)\left(\frac{1}{2}\frac{1}{\sqrt{100-16}}\right)(-2)(4)(2)$ 1

$= 2\sqrt{21} - \frac{16}{2\sqrt{21}}$

$= \frac{84-16}{2\sqrt{21}} = \frac{34}{\sqrt{21}}\ ft^2/min$ 1

The tip of the second hand of a clock is 8 inches from the center of the clock. The clock has a crystal 7 inches from the center, where the "12" would normally be. How quickly is the tip of the second hand approaching the crystal at 9:30:45am ? **(HINT: What rate of change information is implied, but not stated ?)** SCORE: ___ / 5 POINTS



AT 9:30:45 AM
$\theta = \frac{\pi}{2}$
$d = \sqrt{8^2+7^2}$
$= \sqrt{113}$

$\frac{1}{2}$ $\frac{d\theta}{dt} = -\frac{2\pi}{60\,sec} = -\frac{\pi}{30\,sec}$ AT 9:30:45 AM

WANT $\frac{dd}{dt}\Big|_{\theta=\frac{\pi}{2}}$ $\frac{1}{2}$

$d^2 = 8^2 + 7^2 - 2\cdot 8\cdot 7\cdot\cos\theta$ 1

$d^2 = 113 - 112\cos\theta$

$2d\frac{dd}{dt} = 112\sin\theta\frac{d\theta}{dt}$ 1

$2\sqrt{113}\frac{dd}{dt} = 112\left(\sin\frac{\pi}{2}\right)\left(-\frac{\pi}{30}\right)$ 1

$\frac{dd}{dt} = \frac{-112\pi}{60\sqrt{113}}\frac{in}{sec} = \frac{-28\pi}{15\sqrt{113}}\frac{in}{sec}$ 1

NOTE: UNITS $\sqrt{113}$ in, $113\,in^2, 112\,in^2$, $-\frac{\pi}{30\,sec}$