$2+6+4+3 =$ 15 total

MATH 135 Problem Set 2, 'B' Solutions

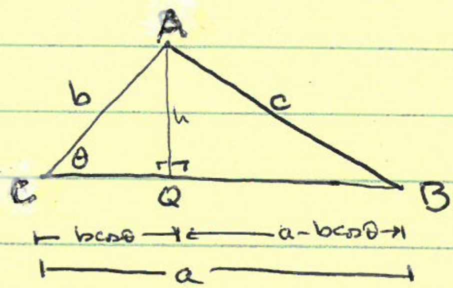
1.4/

59. $PQ^2 = 8^2 + 10^2 - 2\cdot 8\cdot 10\cdot \cos(7\pi/9)$ (1)

$= 164 - 160\cos(7\pi/9)$

$\doteq 286.57$ If this is correct but this is not, add note: Check calculator is in radian mode.

so $PQ \doteq \sqrt{286.57} \doteq 16.93$ (1)

60. 

From the triangle ΔAQC, $\overline{CQ} = b\cos\theta$ (1), so $\overline{QB} = a - \overline{CQ} = a - b\cos\theta$. Let $h = \overline{AQ}$, the altitude of the triangle. Then from the Pythagorean theorem in ΔAQC and ΔAQB,

$$b^2 = h^2 + b^2\cos^2\theta \text{ (1)} \quad \text{and} \quad c^2 = h^2 + (a - b\cos\theta)^2 \text{ (1)}$$

We write the first equation as $h^2 = b^2 - b^2\cos^2\theta$, then substitute for h^2 in the second:

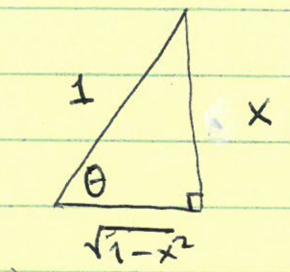
$$c^2 = b^2 - b^2\cos^2\theta + (a - b\cos\theta)^2 \text{ (1)}$$

$$= b^2 - \cancel{b^2\cos^2\theta} + a^2 - 2ab\cos\theta + \cancel{b^2\cos^2\theta}$$

$$c^2 = a^2 + b^2 - 2ab\cos\theta, \text{ (2)}$$

which is the Law of Cosines we were trying to show

1.5/46. Let $\theta = \sin^{-1} x$, then $\sin\theta = x$, and we can compute other trig functions of θ using the triangle



$\left(\frac{\text{opp}}{\text{hyp}} = \sin\theta = \frac{x}{1}\right.$, then $\text{adj} = \sqrt{1-x^2}$ from Pythagoras th.$\left.\right]$

2

Then

$$\cot(\sin^{-1} x) = \cot\theta = \frac{\text{adj}}{\text{opp}} = \frac{\sqrt{1-x^2}}{x}.$$

2

1.6/42. Given $P(t) = 2.4\, e^{(.06)t}$ (in millions)

(a) $P(0) = (2.4)\cdot(1)$ (million)

$= 2.4$ 1

(b) the population doubles when $P(t) = (2)\cdot(2.4) = 4.8$

$4.8 = 2.4 e^{(.06)t}$ 1

$2 = e^{(.06)t}$

$\frac{\ln(2)}{.06} = t$ 1 either form is OK

or $t \doteq 11.55$ years