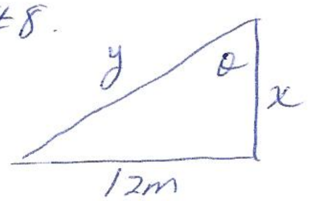
#8.

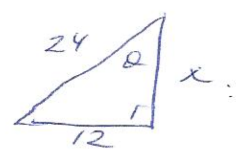



$$\frac{dx}{dt} = 10\frac{m}{min}$$

$$\tan\theta = \frac{12}{x}$$

Derivative: $\sec^2\theta \frac{d\theta}{dt} = \frac{-12}{x^2}\frac{dx}{dt}$

Determine $\sec\theta$ when $y = 24$.




$$x^2 = 24^2 - 12^2$$
$$x^2 = 432$$
$$x = 12\sqrt{3}$$

$$\cos\theta = \frac{x}{24}$$
$$\cos\theta = \frac{12\sqrt{3}}{24} = \frac{\sqrt{3}}{2}$$
$$\sec\theta = \frac{2}{\sqrt{3}}$$

Substitution

$$\sec^2\theta \frac{d\theta}{dt} = -\frac{12}{x^2}\frac{dx}{dt}$$

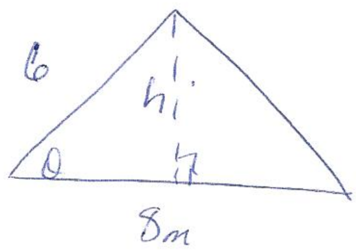
$$\left(\frac{2}{\sqrt{3}}\right)^2 \frac{d\theta}{dt} = \frac{-12}{(12\sqrt{3})^2}\cdot(10)$$

$$\frac{4}{3}\frac{d\theta}{dt} = \frac{-12}{423}(10)$$

$$\frac{d\theta}{dt} = \frac{-120}{423}\cdot\frac{3}{4}$$

$$\frac{d\theta}{dt} = -\frac{10}{47}\frac{rad}{min}$$

9.




used one of my sides as the base to substitute into Area formula.

$A = \frac{1}{2}bh.$

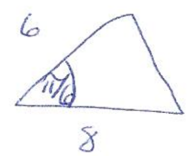
$A = \frac{1}{2}8(h)$

$A = \frac{1}{2}8(6\sin\theta)$

$A = 24\sin\theta$

$\sin\theta = \frac{h}{6}$

$h = 6\sin\theta$

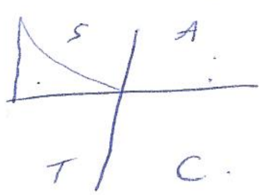



$\frac{dA}{dt} = 24\cos\theta \frac{d\theta}{dt}$

$\frac{dA}{dt} = 24\cos(\pi/6)(-0.035)$

$\frac{dA}{dt} = -0.7 \frac{m^2}{sec}$

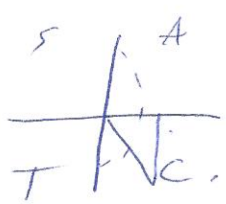
10a) $\cos^{-1}(-\frac{1}{2}) \Rightarrow \cos\theta = -\frac{1}{2}$ where $[0, \pi]$




ref $60^\circ$

$\boxed{\cos^{-1}(-1/2) = \frac{2\pi}{3}}$

b) $\tan^{-1}(-1) \Rightarrow \tan\theta = -1$ where $(-\pi/2, \pi/2)$



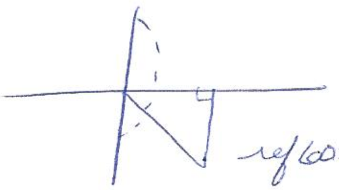

ref $\frac{\pi}{4}$

$\boxed{\tan^{-1}(-1) = \frac{7\pi}{4}}$

10c) $\text{Arctan}\left(\tan \frac{2\pi}{3}\right)$

$\tan \frac{2\pi}{3} = \frac{-\sqrt{3}}{1}$

$\text{Artan}(-\sqrt{3}) \Rightarrow \tan \theta = -\sqrt{3}$ where $(-\pi/2, \pi/2)$



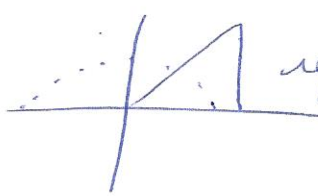
ref $60 = \frac{\pi}{3}$

$\boxed{\text{Arctan}(-\sqrt{3}) = \frac{5\pi}{3}}$

10d) $\arccos\left(\sin \frac{\pi}{4}\right)$

$\sin \frac{\pi}{4} = \frac{\sqrt{2}}{2}$

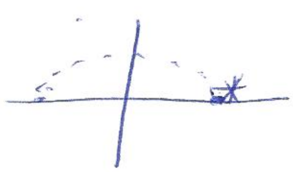
$\arccos\left(\frac{\sqrt{2}}{2}\right) \Rightarrow \cos \theta = \frac{\sqrt{2}}{2}$ where $[0, \pi]$



ref $\frac{\pi}{4}$

$\boxed{\arccos\left(\sin \frac{\pi}{4}\right) = \frac{\pi}{4}}$

10e) $\cos^{-1}(1) \Rightarrow \cos \theta = 1$ where $[0, \pi]$



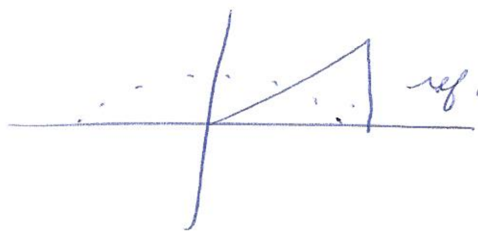
$\boxed{\cos^{-1}(1) = 0}$

10f) $\cos^{-1}\left(\sin\frac{\pi}{4} - \sin\frac{\pi}{6}\right)$

$\sin\frac{\pi}{4} - \sin\frac{\pi}{6} = \frac{\sqrt{2}}{2} - \frac{1}{2} = \frac{\sqrt{2}-1}{2}$

$\cos^{-1}\left(\frac{\sqrt{2}-1}{2}\right) \Rightarrow \cos\theta = \frac{\sqrt{2}-1}{2}$ where $[0, \pi]$

$\approx$



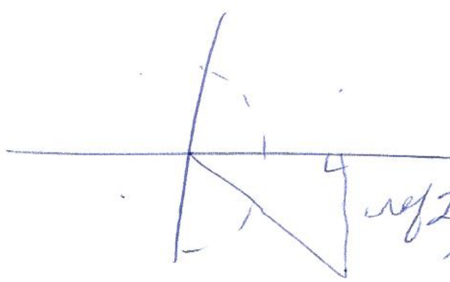
ref. $78° \approx 1.36$rad

$$\boxed{\cos^{-1}\left(\sin\frac{\pi}{4} - \sin\frac{\pi}{6}\right) = 1.36 \text{ rad}}$$

10g) $\sin^{-1}\left(\cos\frac{\pi}{3} - \cos\frac{\pi}{6}\right)$

$\sin^{-1}\left(\frac{1}{2} - \frac{\sqrt{3}}{2}\right)$

$\sin^{-1}\left(\frac{1-\sqrt{3}}{2}\right) \Rightarrow \sin\theta = \frac{1-\sqrt{3}}{2}$ where $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$



ref $21.5°$
$\approx 0.37$rad.

$\sin^{-1}\left(\cos\frac{\pi}{3} - \cos\frac{\pi}{6}\right) = 5.9$rad

$\Rightarrow 2\pi - 0.37$rad
$= 5.9$ rad.