# ASSIGNMENT #3 SOLUTIONS

943-DW (Applied MATH)

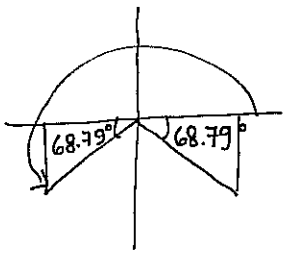
DECEMBER 5th 2012

## CHAPTER 8

#50 $\sin\theta = -0.9323$

$\sin^{-1}(-0.9323) = -68.79^\circ \Rightarrow$ solution 1 $291.20^\circ$

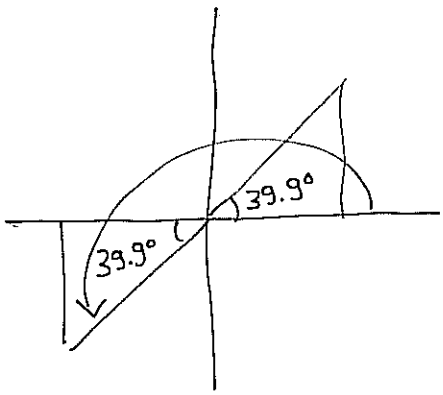
Solution 2 $248.79^\circ$




#52 $\cot\theta = 1.196$

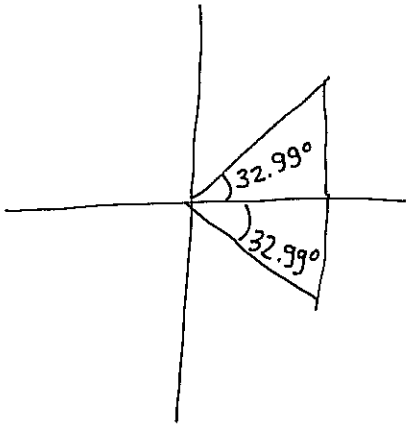
$\tan\theta = \dfrac{1}{1.196}$

Solut$^n$ 1 $\theta = 39.9^\circ$ solution 2 $180^\circ + 39.9^\circ = 219.9^\circ$



#53 $\cos\theta = 0.8387$ $\cos^{-1}(0.8387)$

$= 32.99°$




Solution 1 $32.99°$

$= 0.576$ rads

Solution 2 $360° - 32.99°$

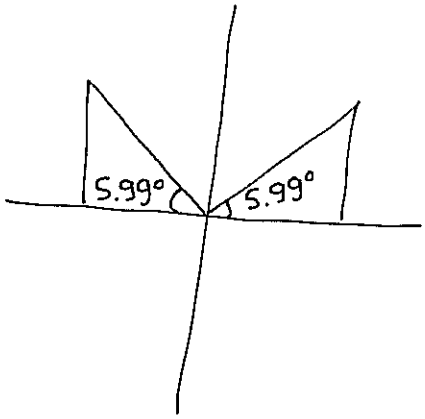
$= 327.01°$

$= 5.71$ rads

$\boxed{\text{Solutions } 0.576 \text{ \& } 5.71}$

# 54 $\sin\theta = 0.1045$

$\sin^{-1}(0.1045) = 5.99°$




Solution 1 $5.99°$

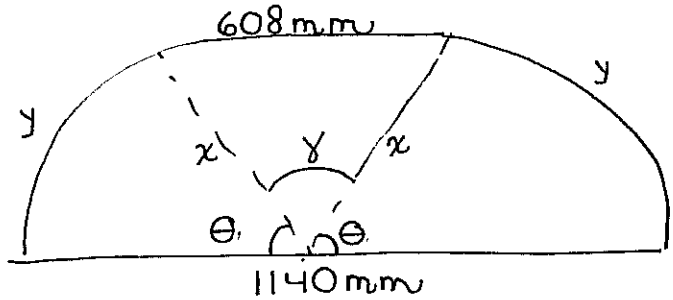
$= 0.1045$

Solution 2 $174°$

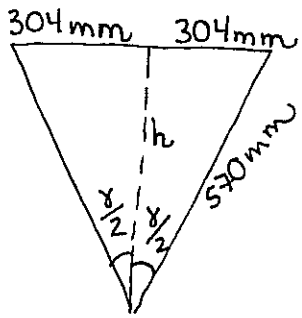
$= 3.04$

$\boxed{\text{solutions } 0.1045 \text{ \& } 3.04}$

# 80




$x = 570\text{mm}$




$$\sin\left(\frac{\gamma}{2}\right) = \frac{304}{570}$$

$$\frac{\gamma}{2} = 32.23°$$

$$\gamma = 64.46°$$

$$h^2 + 304^2 = 570^2$$

$$h^2 = 232484$$

$$h = 482.17\text{ mm}$$

AREA OF TRIANGLE

$$\frac{1}{2}(482.17)(608)$$

$$= 146{,}579.68\ \text{mm}^2$$

$$2\theta = 180° - 64.46°$$

$$= 115.54°$$

$$\theta = 57.77°$$

$$= 1.01\text{ rads}$$

AREA OF SECTOR

$$A = \frac{1}{2}\theta r^2$$

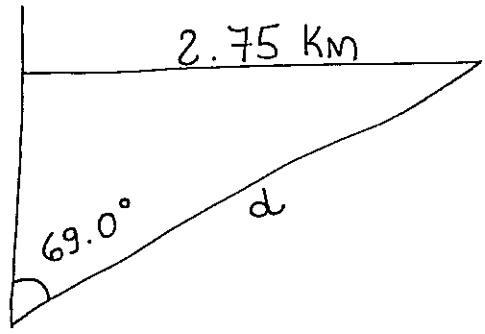
$$= \frac{1}{2}(1.01)(570)^2$$

$$= 163{,}791.85\ \text{mm}^2$$

TOTAL AREA $= 474{,}163.4\ \text{mm}^2$

CHAPTER 4

#72




WE CALCULATE THE DISTANCE d THAT THE BOAT MUST TRAVEL

$$\sin 69° = \frac{2.75}{d}$$

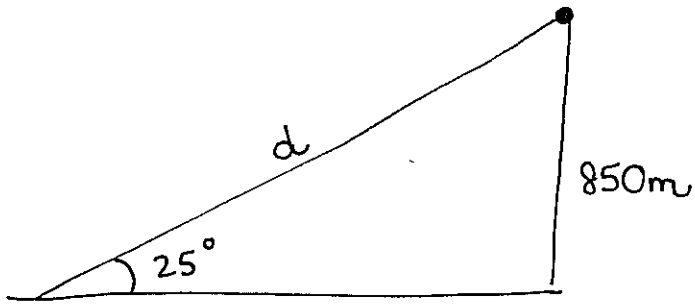
$$d = \frac{2.75}{\sin 69°} = 2.95 \text{ Km}$$

THE BOAT TRAVELS AT 37.5 Km/hr :

$$\text{TIME TRAVELLED} = \frac{2.95 \text{ Km}}{37.5 \text{ Km/hr}}$$

$$= 0.0786 \text{ hrs}$$

$$= \boxed{4.72 \text{ minutes}}$$




① we start by computing the distance the sound travels

$$\sin 25° = \frac{850}{d}$$

$$d = \frac{850}{\sin 25°} = 2011.271 \text{ m}$$

② Then we compute the time it took to travel this distance

$$\text{Time} = \frac{2011.271 \text{ m}}{340 \text{ m/s}} = 5.9155 \text{ s}$$

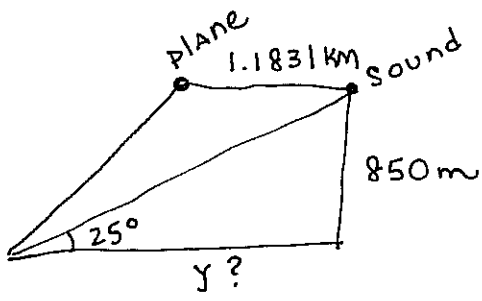
③ This means when the person looks up the plane has been travelling for 5.9155 seconds

distance travelled by plane

$$= 720 \frac{\text{Km}}{\text{hr}} \cdot 5.9155 \text{ s} \cdot \frac{1 \text{ hr}}{3600 \text{ s}}$$

$$= 1.1831 \text{ Km}$$

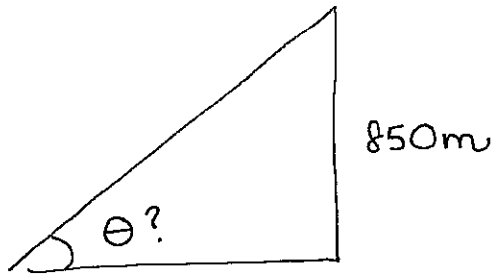
④




$$\tan 25° = \frac{850}{y}$$

$$y = 1.8228 \text{ Km}$$

(5)




$1.8228\,KM - 1.1831\,KM$
$= 0.6397\,KM$

$$\tan\theta = \frac{0.85}{0.6397}$$

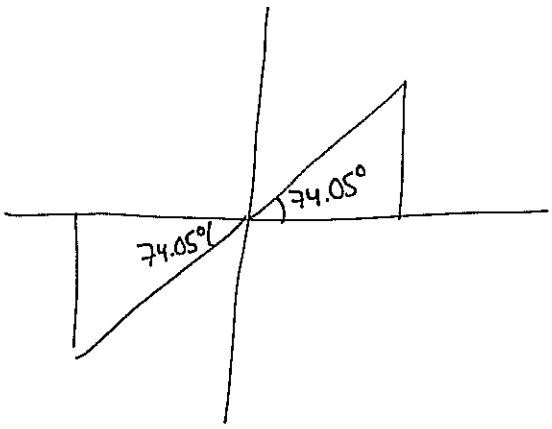
$$\boxed{\theta = 53.03^\circ}$$

CHAPTER 20

# 65

$$3(\tan x - 2) = 1 + \tan x$$
$$3\tan x - 6 = 1 + \tan x$$
$$2\tan x = 7$$
$$\tan x = 7/2$$

$$\tan^{-1}(7/2) = 74.05^\circ$$




Solution 1 $\quad 74.05^\circ$
$= 1.29$ rad

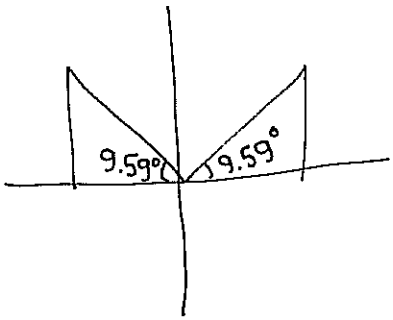
Solution 2 $\quad 180^\circ + 74.05^\circ$
$= 254.05^\circ$
$= 4.43$ rad

$\boxed{\text{Solutions } 1.29 \text{ \& } 4.43}$

#66 $5\sin x = 3 - (\sin x + 2)$

$6\sin x = 1$

$\sin x = 1/6$ $\qquad \sin^{-1}(1/6) = 9.59°$




Solution 1 $\quad 9.59°$
$= 0.167$

Solution 2 $\quad 180° - 9.59°$
$= 170.41°$
$= 2.97$

$\boxed{\text{Solutions } 0.167 \ \& \ 2.97}$

#67 $2(1 - 2\sin^2 x) = 1$

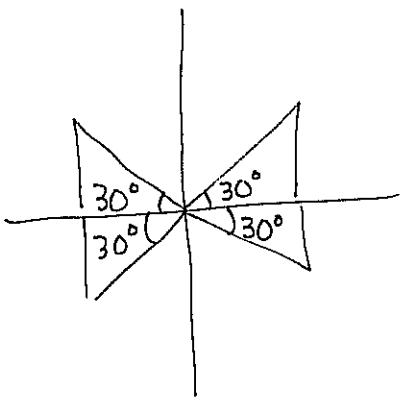
$2 - 4\sin^2 x = 1$

$-4\sin^2 x = -1$

$\sin^2 x = 1/4$

$\sin x = \pm\sqrt{1/4} = \pm 1/2$

$\sin^{-1}(1/2) = 30° \qquad \sin^{-1}(-1/2) = -30°$




Four solutions

$30°, 150°, 210°, 330°$

$\boxed{\pi/6, 5\pi/6, 7\pi/6, 11\pi/6}$

# 69 $2\sin^2\theta + 3\cos\theta - 3 = 0$

WE USE THE IDENTITY $\sin^2\theta = 1 - \cos^2\theta$

$$2(1-\cos^2\theta) + 3\cos\theta - 3 = 0$$

$$-2\cos^2\theta + 3\cos\theta - 1 = 0$$

$$2\cos^2\theta - 3\cos\theta + 1 = 0$$

FACTOR $2\cos^2\theta - 2\cos\theta - \cos\theta + 1 = 0$

$$2\cos\theta(\cos\theta - 1) - (\cos\theta - 1) = 0$$

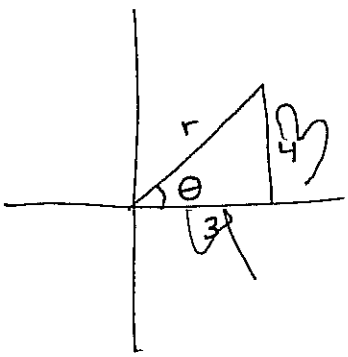
$$(\cos\theta - 1)(2\cos\theta - 1) = 0$$

$\cos\theta = 1$ $\qquad$ $\cos\theta = \frac{1}{2}$

$$\boxed{\theta = 0 \qquad \theta = \pi/3,\ 5\pi/3}$$

CHAPTER 12

# 26 $4 + 3j$




$r^2 = 3^2 + 4^2$

$r = 5$

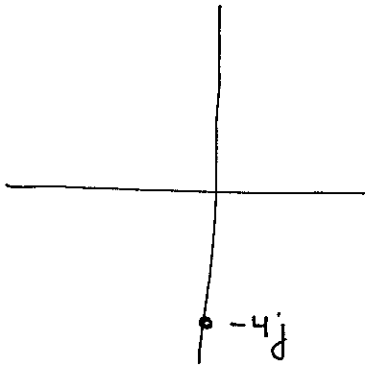
$\tan\theta = 4/3$

$\theta = 53.13^\circ$

$= 0.927$ rads

$$\boxed{\begin{array}{ll} \text{POLAR:} & 5\angle 53.13^\circ \\ \text{EXPONENTIAL:} & 5e^{0.927j} \end{array}}$$

# 32 $-4j$




$\theta = 270^\circ = 3\pi/2$

$r = 4$

polar $4 \angle \underline{270^\circ}$

Exponential $4e^{3\pi/2\, j}$

# 44 $(13.6e^{2.158j})(3.27e^{3.888j})$

$= 44.472\, e^{6.046j}$

$6.046 \text{ rad} = 346.41^\circ$

polar $44.472 \angle \underline{346.41^\circ}$

rectangular $44.472 \cos 346.41^\circ + 44.472 \sin 346.41^\circ\, j$

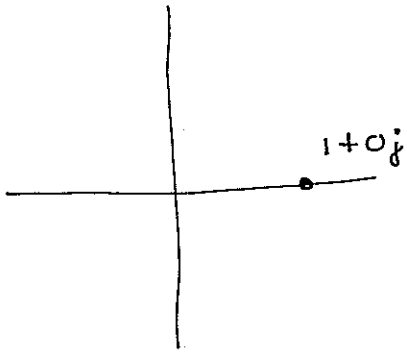
$= 43.23 - 10.45j$

# 66 $x^3 - 1 = 0$

$x^3 = 1$

$x = (1)^{1/3}$

1 in Exponential Form:




$r = 1$ THREE ANGLES

$0°, 360°, 720°$

$0, 2\pi, 4\pi$

THREE EXPONENTIAL FORMS:

$e^{0j}, e^{2\pi j}, e^{4\pi j}$

$(1)^{1/3}$ in exponential form:

① $(e^{0j})^{1/3}$ ② $(e^{2\pi j})^{1/3}$ ③ $(e^{4\pi j})^{1/3}$

$= e^{0j}$ $= e^{2\pi/3\, j}$ $= e^{4\pi/3\, j}$

in rectangular form:

① $\cos 0 + \sin 0\, j$ ② $\cos 2\pi/3 + \sin 2\pi/3\, j$ ③ $\cos 4\pi/3 + \sin 4\pi/3\, j$

$= 1$ $= -1/2 + \sqrt{3}/2\, j$ $= -1/2 - \sqrt{3}/2\, j$

$\boxed{\text{THE THREE SOLUTIONS ARE } 1, -1/2 + \sqrt{3}/2\, j, -1/2 - \sqrt{3}/2\, j}$

#76

$$jx^2 - 2x - 3j = 0$$

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(j)(-3j)}}{2j}$$

$$= \frac{2 \pm \sqrt{4 + 12j^2}}{2j}$$

$$= \frac{2 \pm \sqrt{-8}}{2j}$$

$$= \frac{2 \pm \sqrt{8}j}{2j}$$

$$= \frac{2 \pm 2\sqrt{2}j}{2j}$$

$$= \frac{1 \pm \sqrt{2}j}{j}$$

SOLUTION 1

$$\frac{(1+\sqrt{2}j)}{j}\frac{(-j)}{(-j)} = \frac{-j+\sqrt{2}}{1}$$

$$= \sqrt{2} - j$$

SOLUTION 2

$$\frac{(1-\sqrt{2}j)(-j)}{j\ (-j)} = -j - \sqrt{2}$$

THE SOLUTIONS ARE $\sqrt{2} - j$ & $-\sqrt{2} - j$