						SOLUTI	ON		
A1)	С	A2)	a	A3)	d	A4)	С	A5)	b
$=$ $=$ $\Delta_Z =$	$ \begin{vmatrix} -16 \\ 95 - \\ -2 \\ 3 \\ 5 \end{vmatrix} $	k+15 $7k$ 3 -8 0	5+0-(-13 51 11						
Z =	$\frac{\Delta_Z}{\Lambda}$	2 <u>2</u> -7k							
<i>A</i> +	<i>3B</i> =	$=\begin{pmatrix} 2\\ 9 \end{pmatrix}$	$\begin{pmatrix} 0 \\ 1 \end{pmatrix} + \begin{pmatrix} 0 \\ 0 \end{pmatrix}$	6 3° 0 9)		8 3 9 10)			
AB	$=\begin{pmatrix} 2\\ 9 \end{pmatrix}$	$\begin{pmatrix} 0 \\ 1 \end{pmatrix}$	$\begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix}$	$=\begin{pmatrix} 1 \end{pmatrix}$	4 2	2 2			
		$\begin{bmatrix} 1 \\ -9 \\ 1 \\ -9 \end{bmatrix}$	$\begin{pmatrix} 0 \\ 2 \end{pmatrix} \\ \begin{pmatrix} 0 \\ 2 \end{pmatrix} \end{pmatrix}$						
	$\Delta =$ $=$ $=$ $\Delta_Z =$ $=$ $=$ $A +$ AB	$\Delta = \begin{vmatrix} -2 \\ 3 \\ 5 \end{vmatrix}$ $= -16$ $= 95 - 4$ $\Delta_Z = \begin{vmatrix} -2 \\ 3 \\ 5 \end{vmatrix}$ $= 176$ $= 322$ $Z = \frac{\Delta_Z}{\Delta}$ $= \frac{32}{95 - 4}$ $A + 3B = 4$ $AB = \begin{pmatrix} 2 \\ 9 \end{pmatrix}$ $ A = 2$	$\Delta = \begin{vmatrix} -2 & 3 \\ 3 & -8 \\ 5 & 0 \end{vmatrix}$ $= -16k + 15$ $= 95 - 7k$ $\Delta_z = \begin{vmatrix} -2 & 3 \\ 3 & -8 \\ 5 & 0 \end{vmatrix}$ $= 176 + 765$ $= 322$ $Z = \frac{\Delta_z}{\Delta}$ $= \frac{322}{95 - 7k}$ $A + 3B = \begin{pmatrix} 2 \\ 9 \end{pmatrix}$ $ A = 2$	$\Delta = \begin{vmatrix} -2 & 3 & 2 \\ 3 & -8 & 1 \\ 5 & 0 & -k \end{vmatrix}$ $= -16k + 15 + 0 - ($ $= 95 - 7k$ $\Delta_z = \begin{vmatrix} -2 & 3 & -13 \\ 3 & -8 & 51 \\ 5 & 0 & 11 \end{vmatrix}$ $= 176 + 765 + 0 - 5$ $= 322$ $Z = \frac{\Delta_z}{\Delta}$ $= \frac{322}{95 - 7k}$ $A + 3B = \begin{pmatrix} 2 & 0 \\ 9 & 1 \end{pmatrix} + \begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix}$	$\Delta = \begin{vmatrix} -2 & 3 & 2 \\ 3 & -8 & 1 \\ 5 & 0 & -k \end{vmatrix}$ $= -16k + 15 + 0 - (-80)$ $= 95 - 7k$ $\Delta_z = \begin{vmatrix} -2 & 3 & -13 \\ 3 & -8 & 51 \\ 5 & 0 & 11 \end{vmatrix}$ $= 176 + 765 + 0 - 520 - (-6)$ $= 322$ $Z = \frac{\Delta_z}{\Delta}$ $= \frac{322}{95 - 7k}$ $A + 3B = \begin{pmatrix} 2 & 0 \\ 9 & 1 \end{pmatrix} + \begin{pmatrix} 6 & 3 \\ 0 & 9 \end{pmatrix}$ $AB = \begin{pmatrix} 2 & 0 \\ 9 & 1 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$ $ A = 2$	$\Delta = \begin{vmatrix} -2 & 3 & 2 \\ 3 & -8 & 1 \\ 5 & 0 & -k \end{vmatrix}$ $= -16k + 15 + 0 - (-80) - (0)$	A1) c A2) a A3) d A4) $ \Delta = \begin{vmatrix} -2 & 3 & 2 \\ 3 & -8 & 1 \\ 5 & 0 & -k \end{vmatrix} $ $= -16k + 15 + 0 - (-80) - (0) - (-9k)$ $= 95 - 7k$ $ \Delta_z = \begin{vmatrix} -2 & 3 & -13 \\ 3 & -8 & 51 \\ 5 & 0 & 11 \end{vmatrix} $ $= 176 + 765 + 0 - 520 - (0) - (99)$ $= 322$ $ Z = \frac{\Delta_z}{\Delta} $ $= \frac{322}{95 - 7k}$ $ A + 3B = \begin{pmatrix} 2 & 0 \\ 9 & 1 \end{pmatrix} + \begin{pmatrix} 6 & 3 \\ 0 & 9 \end{pmatrix} = \begin{pmatrix} 8 & 3 \\ 9 & 10 \end{pmatrix} $ $ AB = \begin{pmatrix} 2 & 0 \\ 9 & 1 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix} = \begin{pmatrix} 4 & 2 \\ 18 & 12 \end{pmatrix} $ $ A = 2$	$\Delta = \begin{vmatrix} -2 & 3 & 2 \\ 3 & -8 & 1 \\ 5 & 0 & -k \end{vmatrix}$ $= -16k + 15 + 0 - (-80) - (0) - (-9k)$ $= 95 - 7k$ $\Delta_z = \begin{vmatrix} -2 & 3 & -13 \\ 3 & -8 & 51 \\ 5 & 0 & 11 \end{vmatrix}$ $= 176 + 765 + 0 - 520 - (0) - (99)$ $= 322$ $Z = \frac{\Delta_z}{\Delta}$ $= \frac{322}{95 - 7k}$ $A + 3B = \begin{pmatrix} 2 & 0 \\ 9 & 1 \end{pmatrix} + \begin{pmatrix} 6 & 3 \\ 0 & 9 \end{pmatrix} = \begin{pmatrix} 8 & 3 \\ 9 & 10 \end{pmatrix}$ $AB = \begin{pmatrix} 2 & 0 \\ 9 & 1 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix} = \begin{pmatrix} 4 & 2 \\ 18 & 12 \end{pmatrix}$ $ A = 2$	A1) c A2) a A3) d A4) c A5) $ \Delta = \begin{vmatrix} -2 & 3 & 2 \\ 3 & -8 & 1 \\ 5 & 0 & -k \end{vmatrix} $ $= -16k + 15 + 0 - (-80) - (0) - (-9k)$ $= 95 - 7k$ $ \Delta_z = \begin{vmatrix} -2 & 3 & -13 \\ 3 & -8 & 51 \\ 5 & 0 & 11 \end{vmatrix} $ $= 176 + 765 + 0 - 520 - (0) - (99)$ $= 322$ $ Z = \frac{\Delta_z}{\Delta} $ $= \frac{322}{95 - 7k}$ $ A + 3B = \begin{pmatrix} 2 & 0 \\ 9 & 1 \end{pmatrix} + \begin{pmatrix} 6 & 3 \\ 0 & 9 \end{pmatrix} = \begin{pmatrix} 8 & 3 \\ 9 & 10 \end{pmatrix} $ $ AB = \begin{pmatrix} 2 & 0 \\ 9 & 1 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix} = \begin{pmatrix} 4 & 2 \\ 18 & 12 \end{pmatrix} $ $ A = 2$

No.	SOLUTION							
В3	$z_1 = 1 - j = \sqrt{2} \angle - 45^o \text{ or } 1.4142 \angle -45^o$							
(a)	$z_2 = 4\angle - 120^o = -2 - j2\sqrt{3}$							
(b)i	$z_1 + z_2 = (1 - j) + (-2 - j2\sqrt{3})$							
	=-1-j4.464							
	$=4.57\angle -103^{\circ}$							
(b)ii	$z_1 \overline{z_2} = \left(\sqrt{2} \angle -45^\circ\right) \left(4 \angle 120^\circ\right)$							
	$=4\sqrt{2}\angle 75^{\circ}$ or $5.66\angle 75^{\circ}$							
(b) iii	$\frac{z_1}{z_2} = \frac{\sqrt{2} \angle -45^\circ}{4 \angle -120^\circ} = \frac{\sqrt{2}}{4} \angle 75^\circ \text{or} 0.354 \angle 75^\circ$							
(b)	$\left(z_{1}\right)^{3} = \left(\sqrt{2}\angle - 45^{o}\right)^{3}$							
	$=2\sqrt{2} \angle -135^{\circ} \text{ or } 2.83\angle -135^{\circ}$							
B4 (a)	Vertical Axis Y = WS							
	Horizontal Axis $X = W$							
	W 7.20 2.40 1.44 1.03 0.80							
(b)	WS 36.0 24.0 21.6 20.6 20							
(c)	b = gradient							
	$=\frac{24-20}{}$							
	2.4 - 0.8							
	= 2.50							
	Substitute (0.8, 20) into <i>WS=bW + a</i> :							
	20 = 2.5(0.8) + a							
	a = 18							

No.	SOLUTION
B5 (a)	$f'(x) = \frac{1}{4x - 1} \left(4\right) + \left(\frac{1}{1 + 4x^2}\right) \left(2\right)$
	$f'(0) = \frac{1}{-1}(4) + \left(\frac{1}{1+0}\right)(2) = -2$
B5 (b)	$\frac{dy}{dx} = 3e^{2x} \left[\cos(x) \right] + 3\left(2e^{2x} \right) \sin(x)$ $= 3e^{2x} \left[\cos(x) + 2\sin(x) \right]$

No.	SOLUTION
B5 (a)	$f'(x) = \frac{1}{4x - 1} \left(4\right) + \left(\frac{1}{1 + 4x^2}\right) \left(2\right)$
	$f'(0) = \frac{1}{-1}(4) + \left(\frac{1}{1+0}\right)(2) = -2$
B5 (b)	$\frac{dy}{dx} = 3e^{2x} \left[\cos(x) \right] + 3\left(2e^{2x} \right) \sin(x) = 3e^{2x} \left[\cos(x) + 2\sin(x) \right]$
B6a (i)	$A = \pi r^{2}$ $\frac{dA}{dr} = 2\pi r$ $\frac{dA}{dr}\Big _{r=3} = 6\pi$
(ii)	$\frac{dr}{dt} = 0.5 \text{ cm/s}$ $\frac{dA}{dt} = \frac{dA}{dr} \frac{dr}{dt} = 6\pi (0.5) = 3\pi \text{ cm}^2/\text{s}$
B6b	$\frac{dv}{dt} = -110 - 9.8t$ $F = 10(-110 - 9.8t)$
	At $t = 10 \text{ s}$, $F = -1100 - 98(10) = -2080$
B7 (a)i	$\int \left(\frac{2}{x} - e^{6x} + 9\sin(3x)\right) dx = 2\ln x - \frac{e^{6x}}{6} + \frac{9(-\cos(3x))}{3} + C$
B7 (a)ii	$\int \left(\frac{1}{\sqrt{100 - x^2}}\right) dx = \int \left(\frac{1}{\sqrt{10^2 - x^2}}\right) dx = \sin^{-1}\left(\frac{x}{10}\right) + C$
B7 (b)	$h = \int (100 - 25t) dt = 100t - \frac{25t^2}{2} + C$
	At $t = 0$, $h = 0 \Rightarrow C = 0$.
	Therefore $h = 100t - \frac{25t^2}{2}$
	When $t = 3$, $h = 100(3) - \frac{25(3)^2}{2} = 187.5$ metres

No.	SOLUTION
C1	$\int x^3 dx = \frac{x^4}{4} + C$
	$A = \left \int_{-2}^{-1} x^3 dx \right \text{or} -\int_{-2}^{-1} x^3 dx \text{or} \int_{-1}^{-2} x^3 dx$
	$= \left[\frac{\left(-2\right)^4}{4}\right] - \left[\frac{\left(-1\right)^4}{4}\right]$
	$=\frac{15}{4}$
	$B = \int_0^k x^3 dx$
	$= \left[\frac{\left(k\right)^4}{4}\right] - \left[\frac{\left(0\right)^4}{4}\right]$
	$=\frac{k^4}{4}$
	B=4A
	$\frac{k^4}{4} = 4\left(\frac{15}{4}\right)$
	$k^4 = 60$
	k = 2.78 or -2.78 (reject)

No.	SOLUTION
C2 (a)	$\frac{dy}{dx} + 2x = 2\left(3y^2 \frac{dy}{dx}\right) - \left(\frac{1}{x}\right)$
	$\frac{dy}{dx}\left(1-6y^2\right) = \frac{-1-2x^2}{x}$
	$\frac{dy}{dx} = \frac{-1 - 2x^2}{x(1 - 6y^2)} \text{or} \frac{1 + 2x^2}{x(6y^2 - 1)}$
C2	Volume = (x)(5x)(h) = 300
(b) i	$h = \frac{300}{5x^2} = \frac{60}{x^2}$
	C = 10(x)(5x) + 5(2)(x)(h) + 5(2)(5x)(h)
	$=50x^2+60xh$
	$=50x^2+60x\left(\frac{60}{x^2}\right)$
	$=50x^2 + \frac{3600}{x}$
ii	X
	$\frac{dC}{dx} = 100x - 3600x^{-2}$
	$100x - 3600x^{-2} = 0$
	$\frac{100x^3 - 3600}{x^2} = 0$
	$x^3 = 36$
	x = 3.30 cm
	$\frac{d^2C}{dx^2} = 100 + 7200x^{-3}$
	$\left. \frac{d^2C}{dx^2} \right _{x=3.3} = 100 + 7200 (3.30)^{-3} > 0$
	Since $\frac{d^2C}{dx^2} > 0$, C is minimum when $x = 3.30$ cm.

No.	SOLUTION
СЗ	$Z^2 + mZ + 2 = 0$
	$Z = \frac{-m \pm \sqrt{m^2 - 4(1)(2)}}{2}$
	$=\frac{-m\pm\sqrt{m^2-8}}{2}$
	$=\frac{-m\pm\sqrt{-\left(8-m^2\right)}}{2}$
	$=\frac{-m\pm j\sqrt{8-m^2}}{2}$
	Roots are : $Z_1 = \frac{-m}{2} + j \frac{\sqrt{8 - m^2}}{2}$ and $Z_2 = \frac{-m}{2} - j \frac{\sqrt{8 - m^2}}{2}$
	$Z_{1} - Z_{2} = \left(\frac{-m}{2} + j\frac{\sqrt{8 - m^{2}}}{2}\right) - \left(\frac{-m}{2} - j\frac{\sqrt{8 - m^{2}}}{2}\right)$
	$=0+j\frac{2\sqrt{8-m^2}}{2}$
	$=j\sqrt{8-m^2}$
	$ Z_1 - Z_2 = \sqrt{0 + \left(\sqrt{8 - m^2}\right)^2} = 2$
	$\sqrt{8-m^2}=2$
	$8 - m^2 = 4$ $m^2 = 4$
	$m = \pm 2$