

Candidate 1

QUESTION NUMBER	DO NOT WRITE IN THIS MARGIN								
1.	$y = \frac{1}{2}x^4 - 2x^3 + 6$ $\frac{dy}{dx} = \cancel{4x^3} - 6x^2$ <p>SP's when $\frac{dy}{dx} = 0$</p> $0 = 2x^3 - 6x^2$ $0 = 2x^2(x - 3)$ <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">↓</td> <td style="text-align: center;">↓</td> </tr> <tr> <td>$2x^2 = 0$</td> <td>$x - 3 = 0$</td> </tr> <tr> <td>$x^2 = 2$</td> <td>$x = 3$</td> </tr> <tr> <td>$x = \sqrt{2}$</td> <td></td> </tr> </table> <p>SP (3, 5) ($\sqrt{2}$, $4\sqrt{2}$)</p> <p style="text-align: right;">Sub 3 into orig</p> $y = \frac{1}{2}(3)^4 - 2(3)^3 + 6$ $y = \frac{1}{2}(81) - 2(27) + 6$ $y = 17 - 18 + 6$ $y = 5$ <p style="text-align: right;">Sub $\sqrt{2}$ into orig</p> $y = \frac{1}{2}(\sqrt{2})^4 - 2(\sqrt{2})^3 + 6$ $y = \frac{1}{2}(4) - 2(2\sqrt{2}) + 6$ $y = 2 - 4\sqrt{2} + 6$ $y = 8 - 4\sqrt{2}$ $y = 4\sqrt{2}$	↓	↓	$2x^2 = 0$	$x - 3 = 0$	$x^2 = 2$	$x = 3$	$x = \sqrt{2}$	
↓	↓								
$2x^2 = 0$	$x - 3 = 0$								
$x^2 = 2$	$x = 3$								
$x = \sqrt{2}$									

Candidate 2

QUESTION NUMBER	<p>1. $y = \frac{1}{2}x^4 - 2x^3 + 6$</p> $\frac{dy}{dx} = 4 \times \frac{1}{2}x^3 - 2x^2 \times 3$ $\therefore \frac{dy}{dx} = 2x^3 - 6x^2$ <p>For stationary points $\frac{dy}{dx} = 0$</p> $2x^3 - 6x^2 = 0$ $\cancel{2x^2} (x - 3) = 0 \quad \text{or} \quad 2x^2(x - 6) = 0$ $2x^2 = 0 \quad ; \quad x - 6 = 0$ $x = 0 \quad \text{or} \quad x = 6$	DO NOT WRITE IN THIS MARGIN
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Candidate 3

$$y = \frac{1}{2}x^4 - 2x^3 + 6$$

$$\frac{dy}{dx} = 2x^3 - 6x^2$$

Stationary points occur when $\frac{dy}{dx} = 0$.

$$\text{Sub } x = 0 \text{ in } \frac{dy}{dx} = 2(0)^3 - 6(0)^2 \\ = \underline{\underline{0}}.$$

Candidate 4

$$x^2 + (k-5)x + 1 = 0$$

$x^2 = a$ $(k-5) = b$ $1 = c$
 Equal roots
 $b^2 - 4ac = 0$

$$(k-5)^2 - 4 \times x^2 \times 1 = 0$$
~~$$(k-5)^2 - 4x^2 = 0$$~~

$$1^2 ((k-5) - 4x) = 0$$
~~$$1^2 = 0$$~~
~~$$(k-5) - 4x = 0$$~~

$$(k-5) - 4x = 0$$
~~$$k-5 = 4x$$~~

$$k - 4x = 5$$

Candidate 5

2. for equal roots
 $b^2 - 4ac = 0$

$$x^2 + c(k-5)x + 1 = 0 \quad a=1$$

$$ax^2 + bx + c = 0 \quad b=k-5$$

$$c=1$$

$$b^2 - 4ac = (k-5)^2 - (4 \times 1 \times 1)$$

$$(k^2 - 10k + 25) - 4$$

$$k^2 - 10k + 25 - 4 = k^2 - 10k + 21$$

$$k^2 - 10k + 21 = 0$$

$$= -21$$

$$k^2 = -21 + 10k$$

$$k = \pm \sqrt{-21 + 10k}$$

$$k = \sqrt{-21 + 10k} \quad \text{or} \quad k = -\sqrt{-21 + 10k}$$

Candidate 6

QUESTION NUMBER	$r = \sqrt{y^2 + x^2} = c$ $\leq \sqrt{3^2 + 1} = 26$ $= \sqrt{4 + 1} = 26$ $= \sqrt{16}$ $= 4$	DO NOT WRITE IN THIS MARGIN
3.	$\begin{matrix} & (c_1) & \\ \swarrow & & \searrow \\ -y=3 & & -x=1 \end{matrix}$ $C_2 \rightarrow \underline{(x-4)^2 + (y+2)^2 = 16}$	

Candidate 7

4.(a)	$y = mx + c$ $11 = m \cdot 9 + c$ $2 = m \cdot 3$ $\underline{m = \frac{2}{3}}$ $11 = \left(\frac{2}{3}\right)9 + c$ $11 = 6 + c$ $\underline{c = 5}$
4.(b)	$u_4 = m u_3 + c$ $= \frac{2}{3}(11) + 5$ $= \frac{35}{3} + \frac{5}{1}$ $= \underline{\underline{\frac{50}{3}}}$

Candidate 8

4.(a)	$9 = -6m + c \quad 6m + c = 9$ $11 = 9m + c \quad 9m + c = 11$ $-3m = 2$ $m = -\frac{2}{3}$ $6\left(-\frac{2}{3}\right) + c = 9$ $-4 + c = 9$ $c = 9 + 4$ $c = 13$
4.(b)	$V_4 = -\frac{2}{3}(11) + 13 = -\frac{22}{3} + 13$ $= -7\frac{1}{3} + 13 = 6\frac{1}{3} = \underline{6.33}$ $V_4 \# = 6.33$

Candidate 9

4.(a)	$u_{n+1} = m u_n + c \quad u_0 = 6 \quad u_1 = 9 \quad u_2 = 11$ $9 = m(6) + c$ $11 = m(9) + c$ $\begin{aligned} \cancel{9m + c} &= 11 - \cancel{6m + c} - 9 \\ 9m + c - 11 &= -(6m + c) - 9 \\ &= 3m = 2 \\ m &= \frac{2}{3} \end{aligned}$ $9 = 6 \times \frac{2}{3} + c$ $9 = 4 + c \quad c = 5$
4.(b)	$u_3 = 11m + c$ $u_3 = 11 \times \frac{2}{3} + 5$ $u_3 = \frac{22}{3} + 5 = \frac{22}{3} + \frac{15}{3} = \frac{37}{3}$ $u_4 = \frac{37}{3} m + c = \frac{37}{3} \times \frac{2}{3} + 5$ $= \frac{74}{9} + \frac{45}{9} = \frac{119}{9}$

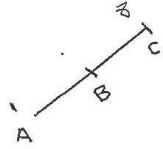
Candidate 10

QUESTION NUMBER	$\begin{aligned}\vec{AB} &= b-a \\ &= \begin{pmatrix} 4 \\ -1 \\ 0 \end{pmatrix} - \begin{pmatrix} 1 \\ 5 \\ -3 \end{pmatrix} \\ &= \begin{pmatrix} 3 \\ -6 \\ 3 \end{pmatrix}\end{aligned}$ $\vec{BC} = c-b$ $= \begin{pmatrix} 8 \\ 4 \\ 4 \end{pmatrix} - \begin{pmatrix} 4 \\ -1 \\ 0 \end{pmatrix}$ $= \begin{pmatrix} 4 \\ 5 \\ 4 \end{pmatrix}$ $\vec{AB} = \frac{3}{4} \vec{BC}$ <p>so the vectors are parallel, and as B is a common point, the vectors are collinear</p>	DO NOT WRITE IN THIS MARGIN
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Candidate 11

QUESTION NUMBER	$\vec{AB} = B - A$ $= \begin{pmatrix} 4 \\ -1 \\ 0 \end{pmatrix} - \begin{pmatrix} 1 \\ 5 \\ -3 \end{pmatrix}$ $= \begin{pmatrix} 3 \\ -6 \\ 3 \end{pmatrix}$ $= 3 \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix}$	$\vec{BC} = C - B$ $= \begin{pmatrix} 8 \\ -9 \\ 4 \end{pmatrix} - \begin{pmatrix} 4 \\ -1 \\ 0 \end{pmatrix}$ $= \begin{pmatrix} 4 \\ -8 \\ 4 \end{pmatrix}$ $= 4 \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix}$	DO NOT WRITE IN THIS MARGIN
5.(a)	<p>Since Both lines share a common point, they are parallel, they have the same co-ordinates \therefore they are collinear.</p>		


Candidate 12

QUESTION NUMBER	A (1, 5, -3) B (4, -1, 0) C (8, -9, 4)		DO NOT WRITE IN THIS MARGIN
5.(a)	$\vec{AB} = \underline{b} - \underline{a}$ $= \begin{pmatrix} 4 \\ -1 \\ 0 \end{pmatrix} - \begin{pmatrix} 1 \\ 5 \\ -3 \end{pmatrix}$ $= \begin{pmatrix} 3 \\ -6 \\ -3 \end{pmatrix}$ $\vec{BC} = \underline{c} - \underline{b}$ $= \begin{pmatrix} 8 \\ -9 \\ 4 \end{pmatrix} - \begin{pmatrix} 4 \\ -1 \\ 0 \end{pmatrix}$ $= \begin{pmatrix} 4 \\ -8 \\ 4 \end{pmatrix}$ <p>Since $\vec{AB} = \vec{BC}$ they are parallel and since B is a common point A, B, C are collinear</p>		
5.(b)	$\underline{\underline{1 : 1}}$		

Candidate 13

	6.	$y = \frac{1}{(1-3x)^5}$		
		$\frac{dy}{dx} \Rightarrow y = 1(1-3x)^{-5}$		
		$\frac{dy}{dx} = -5(1-3x)^{-6}$		
		$\frac{dy}{dx} = 15(1-3x)^{-6}$		
		$\frac{dy}{dx} = \frac{15}{(1-3x)^6}$		

Candidate 14

QUESTION NUMBER	<p>7. Wrong $\tan \theta = m$ $m = \tan 30^\circ$ $= \frac{1}{\sqrt{3}} \times \sqrt{3} = \frac{\sqrt{3}}{3} = \frac{\sqrt{3}}{3}$</p>  <p>$m_{\text{perp}} = \text{Wrong} -\frac{3}{\sqrt{3}}$ $(0, -4)$ $y - b = m(x - a)$ $y + 4 = -\frac{3}{\sqrt{3}}(x - 0)$ $\sqrt{3}(y + 4) = -3(x)$ $\sqrt{3}y + 4\sqrt{3} = -3x$</p> <p style="text-align: right;"><u>$\sqrt{3}y + 3x = -4\sqrt{3}$</u></p> <p style="text-align: right;">Wrong</p>	DO NOT WRITE IN THIS MARGIN

Candidate 15

$$\begin{aligned} m &= \tan \theta \\ m &= \tan \theta \\ m_2 &= \frac{1}{\sqrt{3}} \\ m_{\text{Perpendicular Line}} &= -\sqrt{3} \end{aligned}$$
$$\begin{aligned} a &= 0 \\ b &= -4 \\ m &= -\sqrt{3} \end{aligned} \left. \begin{array}{l} y - b = m(x - a) \\ y + 4 = -\sqrt{3}(x - 0) \\ y + 4 = -\sqrt{3}x + 0 \\ y + 4 = -\sqrt{3}x \\ \underline{y + \sqrt{3}x = -4} \end{array} \right\}$$

Candidate 16

$$\begin{aligned} \tan \theta &= 30^\circ \\ &= \frac{1}{\sqrt{3}} \\ m &= \frac{1}{\sqrt{3}} \end{aligned}$$
$$\begin{aligned} m_{\perp} &= -\sqrt{3} \\ &(0, -4) \end{aligned}$$
$$\begin{aligned} y - b &= m(x - a) \\ y - (-4) &= -\sqrt{3}(x - 0) \\ y + 4 &= -\sqrt{3}x + 0 \\ y &= -\sqrt{3}x + 0 - 4 \\ y &= \underline{-\sqrt{3}x - 4} \end{aligned}$$

Candidate 17

		8.(a) 1/2 $y=y$		
		$2x^2+x+1 = x^2+2x+3$	$\int_{-1}^2 (x^2-x-2) dx$	
		$2x^2+x+1-x^2-2x-3=0$		
		$x^2-x-2=0$		

Candidate 18

8.(b)

$$\int_{-1}^2 -x^2 + x + 2 \, dx$$

$$\Rightarrow \left[-\frac{x^3}{3} + \frac{x^2}{2} + 2x \right]_{-1}^2$$

$$\Rightarrow \left[-\frac{(2)^3}{3} + \frac{(2)^2}{2} + 2(2) \right] - \left[-\frac{(-1)^3}{3} + \frac{(-1)^2}{2} + 2(-1) \right]$$

$$\Rightarrow \left[-\frac{8}{3} + 2 + 4 \right] - \left[\frac{1}{3} + \frac{1}{2} - 2 \right]$$

$$\Rightarrow \left[-\frac{8}{3} + 6 \right] - \left[\frac{2}{6} + \frac{3}{6} - 2 \right]$$

$$\Rightarrow \left[-\frac{8}{3} + \frac{18}{3} \right] - \left[\frac{5}{6} - 2 \right] \Rightarrow \frac{10}{3} + \frac{7}{6}$$

$$\Rightarrow \left[\frac{10}{3} \right] - \left[\frac{5}{6} - \frac{12}{6} \right] \Rightarrow \frac{20}{6} + \frac{7}{6}$$

$$\Rightarrow \frac{10}{3} - \left[-\frac{7}{6} \right] \Rightarrow \frac{27}{6}$$

Solved

shaded area = $\frac{27}{6}$ units²

Candidate 19

8.(a)	<p>upper-lower</p> $\int_{-1}^2 (x^2 + 2x + 3 - (2x^2 + x + 1)) dx$ $\int_{-1}^2 (x^2 + 2x + 3 - 2x^2 - x - 1) dx$ $\int_{-1}^2 (-x^2 + x + 2) dx \Big \left[-\frac{x^3}{3} + \frac{x^2}{2} + 2x \right]_{-1}^2$
8.(b)	<p>upper-lower</p> $\int_{-1}^2 ((x^2 + 2x + 3) - (2x^2 + x + 1)) dx$ $\int_{-1}^2 (x^2 + 2x + 3 - 2x^2 - x - 1) dx$ $\int_{-1}^2 (-x^2 + x + 2) dx$ $\left[-\frac{x^3}{3} + \frac{x^2}{2} + 2x \right]_{-1}^2$ $\left(-\frac{2^3}{3} + \frac{2^2}{2} + 2(2) \right) - \left(-\frac{(-1)^3}{3} + \frac{(-1)^2}{2} + 2(-1) \right)$ $2 \left(-\frac{8}{3} + 2 + 4 \right) - \left(\frac{1}{3} + \frac{1}{2} - 2 \right)$ $\left(-\frac{8}{3} + 6 \right) - \left(\frac{5}{6} - 2 \right)$ $-\frac{10}{3} - \left(-\frac{7}{6} \right) = \frac{22}{6} //$

Candidate 20

9.(a) (i)	$P(2p+16) + 6 + 24$ $P(2p+16) + 30$ $2p^2 + 16p + 30$
9.(a) (ii)	$P(2p+16) + 30 = 0$ $P(2p+16) = -30$ $P = -30$ $2p^2 + 16p + 30 = 0$ $p^2 + 16p + 60 = 0$ $(p+10)(p+6)$ $(p+\frac{10}{2})(p+\frac{6}{2})$ $(p+5)(p+3)$ $2p+16 = 30$ $2p = 30-16$ $2p = 14$ $p = 7$ $p = -5$ $p = -3$ $\therefore \frac{12}{\sqrt{60}}$ $\frac{15}{\sqrt{60}}$

Candidate 21

QUESTION NUMBER 9.(a) (i)	$ \begin{aligned} u \cdot v &= (p \times (2p+16)) + (-2 \times -3) + (4 \times 6) \\ &= 2p^2 + 16p + 6 + 24 \\ &= 2p^2 + 16p + 30 \\ &= \underline{p^2 + 8p + 15} \end{aligned} $
9.(a) (ii)	$ \begin{aligned} u &= \begin{pmatrix} p \\ -2 \\ 4 \end{pmatrix} & v &= \begin{pmatrix} 2p+16 \\ -3 \\ 6 \end{pmatrix} & \begin{matrix} M & A \\ 15 & 8 \end{matrix} \\ & & & & 3, 5 \\ & & & & \text{perpendicular} \\ & & & & \text{- } \underline{15} \\ \underline{h} &= \underline{\frac{1}{3}} \text{ or } \underline{\frac{1}{5}} \end{aligned} $

Candidate 22

11.

$$\int_0^{\frac{\pi}{9}} \cos\left(3x - \frac{\pi}{6}\right) dx$$

$$= \left[\frac{-\sin\left(3x - \frac{\pi}{6}\right)^2}{2 \times 3} \right]_0^{\frac{\pi}{9}}$$

$$= \left[\frac{-\sin\left(3x - \frac{\pi}{6}\right)^2}{6} \right]_0^{\frac{\pi}{9}}$$

$$= \left(\frac{-\sin\left(3\left(\frac{\pi}{9}\right) - \frac{\pi}{6}\right)^2}{6} \right) - \left(\frac{-\sin\left(3(0) - \frac{\pi}{6}\right)^2}{6} \right)$$

$$= \left(\frac{-\sin\left(\frac{3\pi}{9} - \frac{\pi}{6}\right)^2}{6} \right) - \left(\frac{-\sin(30)^2}{6} \right)$$

$$= \left(\frac{-\sin(30)^2}{6} \right) - \left(\frac{-\sin(30)^2}{6} \right)$$

$$= \left(\frac{-\left(\frac{1}{2}\right)^2}{6} \right) - \left(\frac{-\left(\frac{1}{2}\right)^2}{6} \right)$$

$$= \frac{1}{4} - \frac{1}{4} = 0$$

$\frac{\pi}{9} = \frac{180}{9} = 20$
 $60 - 30 = 30$
 $30 = \frac{3 \times 180}{9} = \frac{540}{9} = 60$
 $\frac{3\pi}{9} - \frac{\pi}{6} = \frac{2\pi}{3} = \frac{2 \times 180}{3} = \frac{360}{3} = 120$
 $\frac{39}{100} \times \frac{30}{90} = \frac{117}{100}$
 $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
 $\frac{1}{4} - \frac{1}{4} = 0$

Candidate 23

$$\int_0^{\frac{\pi}{9}} \cos(3x - 30)$$

$$\int_0^{20} \frac{1}{3} \sin(3x - 30)$$

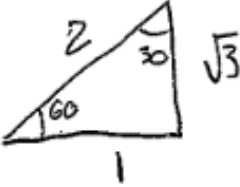
$$= \frac{1}{3} \sin(3(20) - 30) - 0$$

$$= \frac{1}{3} \sin 30 - 0$$

$$= \frac{1}{3} \times \frac{1}{2}$$

$$= \frac{1}{6}$$

$\frac{\pi}{9} = 20^\circ$
 $9 \sqrt{180}$



Candidate 24

$$\int_0^{\frac{\pi}{9}} \cos\left(3x - \frac{\pi}{6}\right) dx$$

$$\int_0^{\frac{\pi}{9}} \frac{\sin\left(3x - \frac{\pi}{6}\right)}{3}$$

$$\left[\frac{1}{3} \sin\left(3x - \frac{\pi}{6}\right) \right]_0^{\frac{\pi}{9}}$$

$$\frac{1}{3} \sin\left(3x \frac{\pi}{9} - \frac{\pi}{6}\right) - \frac{1}{3} \sin\left(3x0 - \frac{\pi}{6}\right)$$

$$\frac{1}{3} \sin(3 \times 20 - 30) - \frac{1}{3} \sin\left(\frac{\pi}{3} - 30\right)$$

$$\frac{1}{3} \sin(60 - 30) - \frac{1}{3} \sin(-30)$$

$$= \frac{1}{3} \sin(30) - \frac{1}{3} \sin(-30)$$

$$= \left(\frac{1}{3} \times \frac{1}{2}\right) - \left(\frac{1}{3} \times -\frac{1}{2}\right)$$

$$= \frac{2}{6} + \frac{2}{6}$$

$$= \frac{4}{6}$$


intergration

\swarrow sin \nwarrow
 $-\cos x$ \cos
 \searrow $-\sin x$ \nearrow

$\frac{\pi}{6} \times \frac{180}{\pi}$
 $\frac{\pi}{9} \times \frac{180}{\pi}$

SOH
CAH
TOA

$\frac{1}{3} \times \frac{1}{2}$
 $\frac{2}{6} \times \frac{2}{6}$
 $\frac{2}{6}$



Candidate 25

QUESTION NUMBER	$g(x) = 5 - x$	DO NOT WRITE IN THIS MARGIN
12.(a)	$f(x) = \frac{1}{\sqrt{x}}$	
	$f(g(x)) = f(5-x)$	
	$f(5-x) = \frac{1}{\sqrt{x}}$	
	$= \frac{1}{\sqrt{5-x}}$	
	$= \frac{1}{(5-x)^{\frac{1}{2}}}$	

Candidate 26

$$\begin{aligned}\sin(p+q) &= \sin p \cos q + \cos p \sin q & \sin q &= \frac{1}{\sqrt{10}} \\ &= \frac{1}{\sqrt{5}} \times \frac{3}{\sqrt{10}} + \frac{2}{\sqrt{5}} \times \frac{1}{\sqrt{10}} & \sin p &= \frac{1}{\sqrt{5}} \\ &= \frac{3}{25\sqrt{2}} + \frac{2}{25\sqrt{2}} \\ &= \frac{5}{25\sqrt{2}} \\ &= \frac{1}{5\sqrt{2}}\end{aligned}$$

Candidate 27

$$\text{Ans } \log_{10} 4 + 2 \log_{10} 5$$

$$\log_{10} 4 + 2 \log_{10} 5^2$$

$$\log_{10} 4 + \log_{10} 25$$

$$\log_{10} (25 \times 4)$$

$$\log_{10} 100$$

$$10^x = 100$$

$$10^2 = 100$$

$$x = 2$$

Candidate 28

$$\log_2(7x-2) - \log_2 3 = 5$$

$$\log_2 \frac{7x-2}{3} = 5$$

$$\frac{7x-2}{3} = 5^2$$

$$\frac{7x-2}{3} = 25$$

$$7x-2 = 75$$

$$7x = 77$$

$$x = 11$$

Candidate 29

QUESTION NUMBER	$\sin 2x + 6 \cos x = 0$ $2 \sin x \cos x + 6 \cos x = 0$ $2 \sin x \cos x = -6 \cos x$ $2 \sin x = \frac{-6 \cos x}{\cos x}$ $2 \sin x = -6$ $\sin x = -3$ $x = \sin^{-1}(-3)$	DO NOT WRITE IN THIS MARGIN
15.(a)		

Candidate 30

QUESTION NUMBER	<p>15.(a) $\frac{1}{2} \sin 2x^\circ + 6 \cos x^\circ = 0$</p> $2 \sin x \cos x + 6 \cos x = 0$ $2 \cos x (\sin x + 3)$ <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> \downarrow $2 \cos x = 0$ $\cos x = 0$ $x = \cos^{-1}(0)$ $x = 90^\circ$ </div> <div style="text-align: center;"> \downarrow $\sin x + 3 = 0$ $\sin x = -3$ $x = \sin^{-1}(-3)$ $x = 30^\circ; 150^\circ$ </div> </div> <div style="text-align: right; margin-top: 20px;"> $\frac{3}{4}$ $\frac{1}{2}$ </div>	DO NOT WRITE IN THIS MARGIN
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Candidate 31

QUESTION NUMBER 16.(a)	$ \begin{aligned} & \begin{matrix} x_1 \\ P(4, k) \end{matrix} \\ & \begin{matrix} x_2 & y_2 \\ C(1, -2) \end{matrix} \\ & R = \sqrt{25} \end{aligned} $ $ \begin{aligned} d &= \sqrt{(x_1 + x_2)^2 + (y_1 + y_2)^2} \\ &= \sqrt{(4 + 1)^2 + (k + (-2))^2} \\ &= \sqrt{5^2 + (k + 2)^2} \\ &= \sqrt{25 + (k^2 + 4k + 4)} \\ d &= \sqrt{k^2 + 4k + 13} \end{aligned} $	DO NOT WRITE IN THIS MARGIN
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Candidate 32

QUESTION
NUMBER

16.(a)

$$P(4, k)$$

$$C(1, -2)$$

$$d = \sqrt{(3)^2 + (k-2)^2}$$

$$= \sqrt{9 + k^2 - 4k + 4}$$

$$= \sqrt{k^2 - 4k + 13}$$

DO NOT
WRITE IN
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MARGIN

16.(b)

~~$d < r$~~ $d > r$

$r = r \text{ of circle} = 5$

 ~~$r_2 = \text{distance between circumference and point } P.$~~

$$\sqrt{k^2 - 4k + 13} > 5$$

$$k^2 - 4k + 13 > 25$$

$$k^2 - 4k - 12 > 0$$

roots

$$x^2 - 4x - 12 = 0$$

$$(x-6)(x+2) = 0$$

$$x=6, x=-2$$

$$k < -2, k > 6$$

sketch

Candidate 33

16.(b)

$$\left(\sqrt{k^2 + 4k + 13}\right)^2 = 5^2 \text{ square both sides}$$

$$k^2 + 4k + 13 = 25$$

$$k^2 + 4k + 13 - 25 = 0$$

$$k^2 + 4k - 12 = 0$$

$$k^2 + 6k - 2k - 12 = 0$$

$$k(k + 6) - 2(k + 6) = 0$$

$$(k + 6)(k - 2) = 0$$

$$k = -6 \text{ or } k = 2$$

~~$-6 < k < 2$~~
 ~~$-6 < k < 2$~~

$\therefore -6 < k < 2$ //

Candidate 34

~~Condition~~

~~$b^2 - 4ac < 0$~~ $r^2 = 25$
 $r = 5$

Point lies outside circle

when $b^2 - 4ac < 0$

~~$4^2 - 4(1)(13) > 0$~~ $(x-1)^2 + (y+2)^2 = 25$
 ~~$16 - 52 > 0$~~
 ~~$-36 > 0$~~
 ~~$b^2 - 4ac < 0$~~

$(4-1)^2 + (k+2)^2 = 25$
 $9 + (k+2)^2 = 25$
 $(k+2)^2 = 16$
 $k+2 = \pm 4$
 $k = -6$ or $k = 2$

P lies outside the circle when

~~$k > 2$~~ and ~~$k < -6$~~
 $k > 2$ and $k < -6$

$k^2 + 4k + 13 = 25$
 $k^2 + 4k - 12 = 0$
 $(k+6)(k-2) = 0$
 $\begin{matrix} \text{u} & \text{u} \\ 0 & 0 \end{matrix}$
 $k = -6$ $k = 2$

Candidate 35

QUESTION NUMBER		DO NOT WRITE IN THIS MARGIN
17.(a)	$\frac{\sin C - \cos C}{\sin^2 C - \cos^2 C}$ $\frac{-\cos C}{-\cos^2 C + \cos^2 C}$ $= \sin^2 C + \cos^2 C - 2\cos C \sin C$ $= 1 - 2\cos C \sin C$ <hr style="width: 50%; margin-left: 0;"/>	$\sin^2 C + \cos^2 C = 1$

Candidate 36

QUESTION NUMBER
17.(a)

$$\sin^2 x - \cos^2 x$$

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

$$\cos^2 x + \sin^2 x = 1$$

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

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

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

$$= 1 + 2\sin^2 x$$

$$\sin 2x - \cos 2x$$

$$= \sqrt{\sin x \cos x} - \sqrt{\cos^2 x - 1}$$

$$= \sin x - \cos x - 1 \equiv 0$$

17.(b)

$$\int (\sin x - \cos x)^2 dx$$

$$\int (1 + 2\sin 2x) dx$$

$$= x + \frac{2\cos 2x}{2} + c$$

$$= x - \cos 2x + c$$