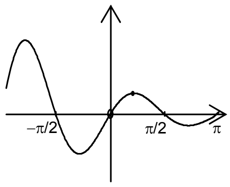
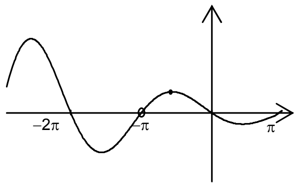
Section B

7(i) $x = 1$	B1 [1]	
(ii) $\frac{dy}{dx} = \frac{(x-1)2x-(x^2+3).1}{(x-1)^2}$	M1	Quotient rule
$= \frac{2x^2-2x-x^2-3}{(x-1)^2}$	A1	correct expression
$= \frac{x^2-2x-3}{(x-1)^2}$		
$dy/dx = 0$ when $x^2 - 2x - 3 = 0$	M1	their numerator = 0
$\Rightarrow (x-3)(x+1) = 0$	M1	solving quadratic by any valid method
$\Rightarrow x = 3$ or -1	A1	$x = 3$ from correct working
When $x = 3$, $y = (9 + 3)/2 = 6$	B1ft	$y = 6$
So P is (3, 6)	[6]	
(iii) Area $= \int_2^3 \frac{x^2+3}{x-1}dx$	M1	Correct integral and limits
$u = x - 1 \Rightarrow du/dx = 1$, $du = dx$ When $x = 2$, $u = 1$; when $x = 3$, $u = 2$	B1	Limits changed, and substituting $dx = du$
$= \int_1^2 \frac{(u+1)^2+3}{u}du$	B1	substituting $\frac{(u+1)^2+3}{u}$
$= \int_1^2 \frac{u^2+2u+4}{u}du$		
$= \int_1^2 (u+2+\frac{4}{u})du$ *	E1	www
$= \left[\frac{1}{2}u^2+2u+4\ln u\right]_1^2$	B1	$[\frac{1}{2}u^2 + 2u + 4\ln u]$
$= (2 + 4 + 4\ln 2) - (\frac{1}{2} + 2 + 4\ln 1)$	M1	substituting correct limits
$= 3\frac{1}{2} + 4\ln 2$	A1cao [7]	
(iv) $e^y = \frac{x^2+3}{x-1}$		
$\Rightarrow e^y \frac{dy}{dx} = \frac{x^2-2x-3}{(x-1)^2}$	M1	$e^y dy/dx$ = their $f'(x)$ or $xe^y - e^y = x^2 + 3$
$\Rightarrow \frac{dy}{dx} = e^{-y}\frac{x^2-2x-3}{(x-1)^2}$	A1ft	$\Rightarrow e^y + xe^y\frac{dy}{dx} - e^y\frac{dy}{dx} = 2x$ $\Rightarrow \frac{dy}{dx} = \frac{2x-e^y}{e^y(x-1)}$
When $x = 2$, $e^y = 7 \Rightarrow$	B1	y = ln 7 or 1.95… or $e^y = 7$
$\Rightarrow dy/dx = \frac{1}{7}.\frac{4-4-3}{1} = -\frac{3}{7}$	A1cao [4]	or $\frac{dy}{dx} = \frac{4-7}{7(2-1)} = -\frac{3}{7}$ or -0.43 or better

8 (i) (*A*)  (*B*) 	B1 B1 M1 A1 [4]	Zeros shown every π/2. Correct shape, from −π to π Translated in *x*-direction π to the left
(ii) $f'(x) = -\frac{1}{5}e^{-\frac{1}{5}x}\sin x + e^{-\frac{1}{5}x}\cos x$ $f'(x) = 0$ when $-\frac{1}{5}e^{-\frac{1}{5}x}\sin x + e^{-\frac{1}{5}x}\cos x = 0$ $\Rightarrow \frac{1}{5}e^{-\frac{1}{5}x}(-\sin x + 5\cos x) = 0$ $\Rightarrow \sin x = 5\cos x$ $\Rightarrow \frac{\sin x}{\cos x} = 5$ $\Rightarrow \tan x = 5$* $\Rightarrow x = 1.37(34\ldots)$ $\Rightarrow y = 0.75$ or $0.74(5\ldots)$	B1 B1 M1 E1 B1 B1 [6]	$e^{-\frac{1}{5}x}\cos x$ $\ldots -\frac{1}{5}e^{-\frac{1}{5}x}\sin x$ dividing by $e^{-\frac{1}{5}x}$ www 1.4 or better, must be in radians 0.75 or better
(iii) $f(x+\pi) = e^{-\frac{1}{5}(x+\pi)}\sin(x+\pi)$ $= e^{-\frac{1}{5}x}e^{-\frac{1}{5}\pi}\sin(x+\pi)$ $= -e^{-\frac{1}{5}x}e^{-\frac{1}{5}\pi}\sin x$ $= -e^{-\frac{1}{5}\pi}f(x)$* $\int_{\pi}^{2\pi} f(x)dx$ let $u = x - \pi$, $du = dx$ $= \int_0^{\pi} f(u+\pi)du$ $= \int_0^{\pi} -e^{-\frac{1}{5}\pi}f(u)du$ $= -e^{-\frac{1}{5}\pi}\int_0^{\pi} f(u)du$* Area enclosed between π and 2π $= (-)e^{-\frac{1}{5}\pi} \times$ area between 0 and π.	M1 A1 A1 E1 B1 B1dep E1 B1 [8]	 $e^{-\frac{1}{5}(x+\pi)} = e^{-\frac{1}{5}x}.e^{-\frac{1}{5}\pi}$ $\sin(x+\pi) = -\sin x$ www $\int f(u+\pi)du$ limits changed using above result or repeating work or multiplied by 0.53 or better