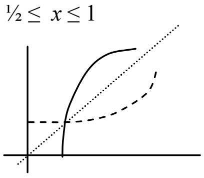
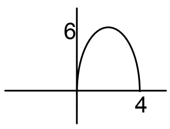
Section B

8(i) $y = 1/(1+\cos\pi/3) = 2/3$.	B1 [1]	or 0.67 or better
(ii) $f'(x) = -1(1+\cos x)^{-2}.-\sin x$ $= \frac{\sin x}{(1+\cos x)^2}$ When $x = \pi/3$, $f'(x) = \frac{\sin(\pi/3)}{(1+\cos(\pi/3))^2}$ $= \frac{\sqrt{3}/2}{(1\frac{1}{2})^2} = \frac{\sqrt{3}}{2} \times \frac{4}{9} = \frac{2\sqrt{3}}{9}$	M1 B1 A1 M1 A1 [5]	chain rule or quotient rule d/dx (cos x) = –sin x soi correct expression substituting $x = \pi/3$ oe or 0.38 or better. (0.385, 0.3849)
(iii) deriv = $\frac{(1+\cos x)\cos x - \sin x.(-\sin x)}{(1+\cos x)^2}$ $= \frac{\cos x + \cos^2 x + \sin^2 x}{(1+\cos x)^2}$ $= \frac{\cos x + 1}{(1+\cos x)^2}$ $= \frac{1}{1+\cos x}$ * Area $= \int_0^{\pi/3} \frac{1}{1+\cos x} dx$ $= \left[\frac{\sin x}{1+\cos x}\right]_0^{\pi/3}$ $= \frac{\sin \pi/3}{1+\cos \pi/3} (-0)$ $= \frac{\sqrt{3}}{2} \times \frac{2}{3} = \frac{\sqrt{3}}{3}$	M1 A1 M1dep E1 B1 M1 A1 cao [7]	Quotient or product rule – condone uv' – u'v for M1 correct expression $\cos^2 x + \sin^2 x = 1$ used dep M1 www substituting limits or $1/\sqrt{3}$ - must be exact
(iv) $y = 1/(1 + \cos x)$ $x \leftrightarrow y$ $x = 1/(1 + \cos y)$ $\Rightarrow$ $1 + \cos y = 1/x$ $\Rightarrow$ $\cos y = 1/x - 1$ $\Rightarrow$ $y = \arccos(1/x - 1)$ * Domain is $½ \le x \le 1$ 	M1 A1 E1 B1 B1 [5]	attempt to invert equation www reasonable reflection in $y = x$

9 (i) $y = \sqrt{4-x^2}$ $\Rightarrow$ $y^2 = 4 - x^2$ $\Rightarrow$ $x^2 + y^2 = 4$ which is equation of a circle centre O radius 2 Square root does not give negative values, so this is only a semi-circle.	M1 A1 B1 [3]	squaring $x^2 + y^2 = 4$ + comment (correct) oe, e.g. f is a function and therefore single valued
(ii) (*A*) Grad of OP = b/a $\Rightarrow$ grad of tangent = $-\frac{a}{b}$ (*B*) $f'(x) = \frac{1}{2}(4-x^2)^{-1/2}.(-2x)$ $= -\frac{x}{\sqrt{4-x^2}}$ $\Rightarrow$ $f'(a) = -\frac{a}{\sqrt{4-a^2}}$ (*C*) $b = \sqrt{(4 - a^2)}$ so $f'(a) = -\frac{a}{b}$ as before	M1 A1 M1 A1 B1 E1 [6]	 chain rule or implicit differentiation oe substituting a into their $f'(x)$
(iii) Translation through $\begin{pmatrix}2\\0\end{pmatrix}$ followed by stretch scale factor 3 in y-direction  	M1 A1 M1 A1 M1 A1 [6]	Translation in x-direction through $\begin{pmatrix}2\\0\end{pmatrix}$ or 2 to right ('shift', 'move' M1 A0) $\begin{pmatrix}2\\0\end{pmatrix}$ alone is SC1 stretch in y-direction (condone y 'axis') (scale) factor 3 elliptical (or circular) shape through (0, 0) and (4, 0) and (2, 6) (soi) –1 if whole ellipse shown
(iv) $y = 3f(x - 2)$ $= 3\sqrt{(4 - (x - 2)^2)}$ $= 3\sqrt{(4 - x^2 + 4x - 4)}$ $= 3\sqrt{(4x - x^2)}$ $\Rightarrow$ $y^2 = 9(4x - x^2)$ $\Rightarrow$ $9x^2 + y^2 = 36x$ *	M1 A1 E1 [3]	or substituting $3\sqrt{(4 - (x - 2)^2)}$ oe for y in $9x^2 + y^2$ $4x - x^2$ www