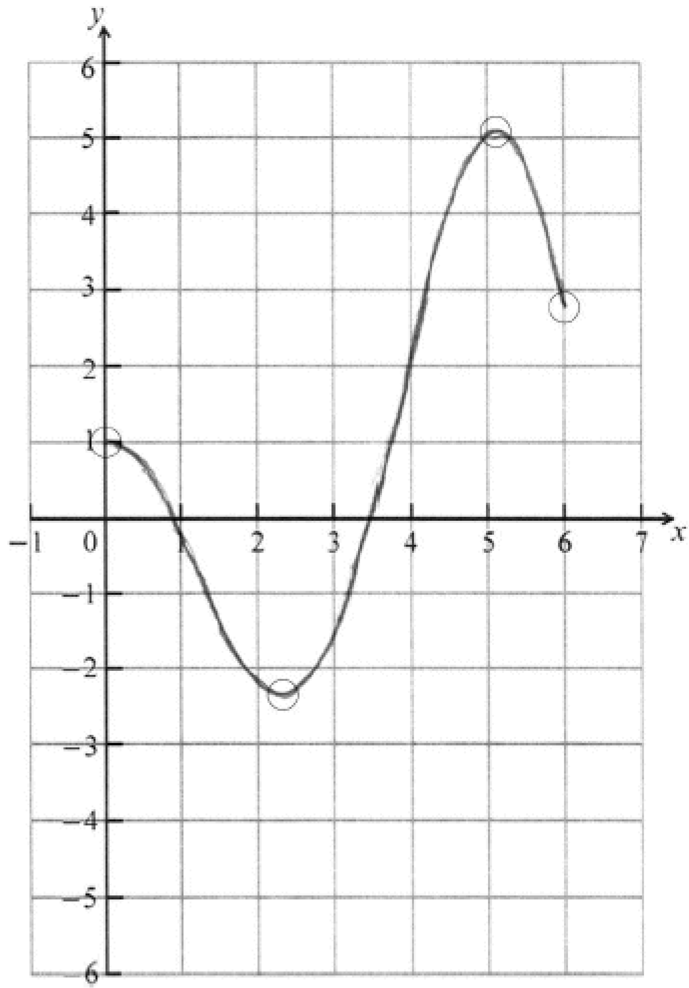
1. (a) evidence of choosing the product rule
e.g. $uv' + vu'$ (M1)
correct derivatives $\cos x$, 2 (A1)(A1)
$g'(x) = 2x\cos x + 2\sin x$ A1 N4

(b) attempt to substitute into gradient function (M1)
e.g. $g'(\pi)$
correct substitution
e.g. $2\pi\cos\pi + 2\sin\pi$ (A1)
gradient $= -2\pi$ A1 N2

[7]

2. (a) evidence of choosing the product rule (M1)
e.g. $x \times (-\sin x) + 1 \times \cos x$
$f'(x) = \cos x - x\sin x$ A1A1 N3

(b)



A1A1A1A1 N4

Note: *Award A1 for correct domain, $0 \le x \le 6$ with endpoints in circles,*
A1 for approximately correct shape,
A1 for local minimum in circle,
A1 for local maximum in circle.

[7]

3. **METHOD 1 (quotient)**
derivative of numerator is 6 (A1)
derivative of denominator is $-\sin x$ (A1)
attempt to substitute into quotient rule (M1)
correct substitution A1

e.g. $\dfrac{(\cos x)(6)-(6x)(-\sin x)}{(\cos x)^2}$

substituting $x = 0$ (A1)

e.g $\dfrac{(\cos 0)(6)-(6\times 0)(-\sin 0)}{(\cos 0)^2}$

$h'(0) = 6$ A1 N2

[6]

METHOD 2 (product)

$h(x) = 6x \times (\cos x)^{-1}$

derivative of $6x$ is 6 (A1)

derivative of $(\cos x)^{-1}$ is $(-(\cos x)^{-2}(-\sin x))$ (A1)

attempt to substitute into product rule (M1)

correct substitution A1

e.g. $(6x)(-(\cos x)^{-2}(-\sin x)) + (6)(\cos x)^{-1}$

substituting $x = 0$ (A1)

e.g. $(6\times 0)(-(\cos 0)^{-2}(-\sin 0)) + (6)(\cos 0)^{-1}$

$h'(0) = 6$ A1 N2

[6]

4. (a) (i) $-3e^{-3x}$ A1 N1

(ii) $\cos\left(x-\dfrac{\pi}{3}\right)$ A1 N1

(b) evidence of choosing product rule (M1)

e.g. $uv' + vu'$

correct expression A1

e.g. $-3e^{-3x}\sin\left(x-\dfrac{\pi}{3}\right)+e^{-3x}\cos\left(x-\dfrac{\pi}{3}\right)$

complete correct substitution of $x = \dfrac{\pi}{3}$ (A1)

e.g. $-3e^{-3\frac{\pi}{3}}\sin\left(\dfrac{\pi}{3}-\dfrac{\pi}{3}\right)+e^{-3\frac{\pi}{3}}\cos\left(\dfrac{\pi}{3}-\dfrac{\pi}{3}\right)$

$h'\left(\dfrac{\pi}{3}\right) = e^{-\pi}$ A1 N3

[6]