

$$i) y = 5x^2 + \frac{5}{x^2} - 8$$

$$= 5x^2 + 5x^{-2} - 8$$

$$\frac{dy}{dx} = 10x - 10x^{-3}$$

$$= 10x - \frac{10}{x^3}$$

$$ii) y = x^3 \cos 5x$$

$$u = x^3$$

$$v = \cos 5x$$

$$\frac{du}{dx} = 3x^2$$

$$\frac{dv}{dx} = -5 \sin 5x$$

$$\frac{dy}{dx} = x^3 \times -5 \sin 5x + \cos 5x \times 3x^2$$

$$= -5x^3 \sin 5x + 3x^2 \cos 5x$$

$$= x^2 (3 \cos 5x - 5x \sin 5x)$$

$$iii) y = 4 \sin(2x-3)$$

$$u = 2x-3$$

$$y = 4 \sin u$$

$$\frac{dy}{du} = 4 \cos u$$

$$\frac{du}{dx} = 2$$

$$\frac{dy}{dx} = 2 \times 4 \cos u$$

$$= 8 \cos(2x-3)$$

$$iv) y = \frac{2 \sin 3x}{x^3}$$

$$u = 2 \sin 3x \quad v = x^3$$

$$\frac{du}{dx} = 6 \cos 3x \quad \frac{dv}{dx} = 3x^2$$

$$\frac{dy}{dx} = \frac{x^3 \times 6 \cos 3x - 2 \sin 3x \times 3x^2}{(x^3)^2}$$

		subtotal	total
1 iv)	$\frac{dy}{dx} = \frac{6x^3 \cos 3x - 6x^2 \sin 3x}{x^6}$	1	
	$= \frac{6x^2 (x \cos 3x - \sin 3x)}{x^6}$	1	
	$= \frac{6 (x \cos 3x - \sin 3x)}{x^4}$	1	6
2)	$i = 2(7 - 3e^{-0.5t})$		
	$= 14 - 6e^{-0.5t}$	1	
	$\frac{di}{dt} = -6 \times -0.5 e^{-0.5t}$	1	
	$= 3e^{-0.5t}$	2	
	at $t = 0$ $\frac{di}{dt} = 3e^{-0.5 \times 0}$	2	
	$= 3 \text{ v/s}$	2	8
3i)	$\int_1^3 5 - 4x + 4x^3 dx$		
	$= \left[5x - \frac{4x^2}{2} + \frac{4x^4}{4} \right]_1^3$	2	
	$= \left[5x - 2x^2 + x^4 \right]_1^3$	1	
	$= (5 \times 3 - 2 \times 3^2 + 3^4) - (5 \times 1 - 2 \times 1^2 + 1^4)$	2	
	$= 15 - 18 + 81 - (5 - 2 + 1)$	2	
	$= 74$	1	8

subtotal
total

$$3ii) \int_{-\pi}^{\pi} (3 \sin x + 6 \cos \frac{1}{2}x) dx$$

$$= \left[-3 \cos x + 12 \sin \frac{1}{2}x \right]_{-\pi}^{\pi}$$

$$= \left[-3 \cos \pi + 12 \sin \left(\frac{\pi}{2} \right) \right] - \left[-3 \cos (-\pi) + 12 \sin \left(-\frac{\pi}{2} \right) \right]$$

$$= [3 + 12] - [3 - 12] = 15 - -9$$

$$= 24$$

$$4i) \frac{5x-6}{4x(x-2)} = \frac{A}{4x} + \frac{B}{x-2}$$

$$= \frac{A(x-2) + 4Bx}{4x(x-2)}$$

$$5x-6 = A(x-2) + 4Bx$$

$$x=2 \quad 10-6 = 8B$$

$$4 = 8B$$

$$B = \frac{1}{2}$$

$$x=0 \quad -6 = A(0-2)$$

$$-6 = -2A$$

$$A = 3$$

$$\frac{5x-6}{4x(x-2)} = \frac{3}{4x} + \frac{1}{2(x-2)}$$

4) 4

$$\int_3^4 \left(\frac{3}{4x} + \frac{1}{2(x-2)} \right) dx$$

3

$$= \left[\frac{3}{4} \ln x + \frac{1}{2} \ln(x-2) \right]_3^4$$

$$= \left[\frac{3}{4} \ln 4 + \frac{1}{2} \ln 2 \right] - \left[\frac{3}{4} \ln 3 + \frac{1}{2} \ln 1 \right]$$

$$= 0.5623$$

subtotal total

2

2

2 18

$$5) \quad h = (4-3)/4 = 0.25$$

2

x	3	3.25	3.5	3.75	4
y	0.75	0.63077	0.54762	0.48571	0.4375

5

$$\int_3^4 \frac{5x-6}{4x(x-2)} dx = \frac{0.25}{3} \left\{ 0.75 + 0.4375 + 4(0.63077 + 0.48571) + 2(0.54762) \right\}$$

3

$$= 0.5624$$

2

$$\frac{0.5624 - 0.5623}{0.5623} \times 100 = 0.0178\%$$

2 14

6)	midpoint(x)	5	15	25	35	45	Subtotal	total
							2	
	f	2	10	17	8	3		
	$xc \times f$	10	150	425	280	135	2	
	$f(xc - \bar{xc})^2$	800	1000	0	800	1200	2	
	$\frac{\sum xcf}{f} = \frac{1000}{40} = 25$						3	
	$\sigma = \sqrt{\frac{3800}{39}}$						2	
	$= 9.87$						3	14

7) $P(A) = 0.75$ $P(B) = 0.82$

i) $P(\text{connection}) = P(A) \times P(B) = 0.615$

ii) $P(\bar{A}) = 0.25$ $P(\bar{B}) = 0.18$

$P(\overline{\text{connection}}) = 0.25 \times 0.18 = 0.045$

$P(\text{connection}) = 1 - 0.045$
 $= 0.955$

1 1 8

