

$$\text{iii)} \quad 2x^2 + 17x = -30$$

$$2x^2 + 17x + 30 = 0$$

$$(2x+15)(x+2) = 0$$

$$x = -15$$

$$x = -2$$

$$\text{iv)} \quad x^2 - 256 = 0$$

$$\sqrt{256}$$

$$(x+16)(x-16)$$

$$x = 16$$

$$x = -16$$

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$$c) i) 27R^2 + 24R + 5$$

$$\cancel{9R^2 + 4R + 5} = (3x+1)(9x+5)$$

$$ii) 81Q^2 - 144U^2$$

$$= 9(3Q+4U)(3Q-4U)$$

$$iii) tr - ty + ur - uy$$

$$= (r-y)(t+u)$$

$$d) i) x^2 + 9x + 8 = 0$$

$$(x+1)(x+8) = 0$$

$$x^2 + 8x + x + 8 = 0$$

$$x^2 + 9x + 8 = 0$$

$$x = 1 \quad x = 8$$

$$ii) 12x^2 - 5x - 3 = 0$$

$$(6x-1)(2x+3)$$

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$$b) ii) \frac{(4x-1)}{3} - \frac{x}{4} = \frac{(4x+3)}{2}$$

$$\frac{(4x-1)}{3} \times 12 - \frac{x}{4} \times 12 = \frac{(4x+3)}{2} \times 12$$

$$4(4x-1) - 3x = 6(4x+3)$$

$$16x - 4 - 3x = 24x + 18$$

$$16x - 3x - 24x = 18 + 4$$

$$-11x = 22$$

$$\boxed{x = -2}$$

~~$$iii) 2 \log(5x+3) = \log(x+1) + \log(x+2)$$~~

~~16~~

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[265]

### Question 2

a) i)  $y = 8x^3 - 2x^2 + x + 10$

$$\frac{dy}{dx} = 24x^2 - 4x + 1$$

ii)  $y = (5x - 3)(6x - 1)$

$$y = 30x^2 - 5x - 18x + 3$$

$$y = 30x^2 - 23x + 3$$

$$\frac{dy}{dx} = 60x - 23$$

iii)  $y = \frac{3}{\sqrt{x}} + \ln x$

$$y = \frac{3}{x^{0.5}} + \frac{1}{x}$$

$$\frac{dy}{dx} = \frac{3}{0.5x^{-0.5}} - 0.5 + \frac{1}{x}$$

iv)  $y = 5 \sin \frac{x}{2} - 6 \cos 3x - \tan \frac{x}{3}$

$$\frac{dy}{dx} = \frac{5}{2} \cos\left(\frac{x}{2}\right) + 18 \sin(3x) + \frac{1}{3} \sec^2\left(\frac{x}{3}\right)$$

v)  $y = e^{7x} \tan 3x$

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a) vi)  $y = \frac{\sin 2x}{e^{3x}}$

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

vii)  $y = \sqrt[3]{4x^3 - 2x + 1}$

$$\frac{dy}{dx} = \frac{12x^3 - 2}{3(4x^3 - 2x + 1)^{\frac{2}{3}}}$$

b)  $y = \sin 2x$

$$\frac{dy}{dx} = \cos(2x) \cdot 2$$

$$\frac{d^2y}{dx^2} = -4 \sin(2x)$$

$$\frac{d^3y}{dx^3} = -8 \cos(2x)$$

$$d^4y = 16 \sin(2x)$$

c)  $z = x^5 + 3x^3y^2 + 4y^5$

$$\frac{\partial^2 z}{\partial x^2} = 20x^3 + 18y^2x$$

$$\frac{\partial^2 z}{\partial y^2} = 80y^3 + 6x^3$$

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Question One

[5]

a)  $V_{\min} = \sqrt{\frac{\omega}{s} \times \frac{2}{r} \times \frac{1}{CL}}$

$$V_{\min}^2 = \frac{\omega}{s} \times \frac{2}{r} \times \frac{1}{CL}$$

$$\frac{V_{\min}^2 \times r \times CL}{2 \times 1} = \frac{\omega}{s} = \frac{V_{\min}^2 \times r \times CL}{2 \times 1 \times \omega} = s$$

~~V<sub>min</sub>~~  $s = \frac{200^2 \times 0.41 \times 0.52}{2 \times 1 \times 490332}$

$$s = 8.70 \times 10^{-3} \text{ m}^2$$

b)i)  $\frac{8x-3}{5} = \frac{-5x+6}{-3}$

$$-3(8x-3) = 5(-5x+6)$$

$$-24x+9 = -25x+30$$

~~$8x-3 = -5x+6$   
 $8x+5x = 6-5+3+3$   
 $13x = 7$   
 $x = \frac{7}{13}$~~