

Q1

$$v_{min} \sqrt{\frac{w}{g} \times \frac{2}{\rho} \times \frac{1}{cl}}$$

$$(v_{min})^2 = \frac{w}{g} \times \frac{2}{\rho} \times \frac{1}{cl}$$

$$\frac{(v_{min})^2}{\frac{2}{\rho} \times \frac{1}{cl}} = \frac{w}{g}$$

$$s = \frac{w}{\frac{(v_{min})^2}{\frac{2}{\rho} \times \frac{1}{cl}}}$$

$$s = w \frac{(\frac{2}{\rho} + \frac{1}{cl})}{(v_{min})^2}$$

Exam

Question ONE

$$\textcircled{a} \quad V_{min} = \sqrt{\frac{1}{3} \times \frac{2}{3} \times \frac{1}{3} \times \frac{1}{3}} \\ (V_{min})^2 = \frac{1}{3} \times \frac{2}{3} \times \frac{1}{3} \times \frac{1}{3} \\ \frac{(V_{min})^2}{\frac{1}{3} \times \frac{2}{3} \times \frac{1}{3} \times \frac{1}{3}} = \frac{1}{3} \times \frac{2}{3} \times \frac{1}{3} \times \frac{1}{3} \\ \frac{1}{3} \times \frac{2}{3} \times \frac{1}{3} \times \frac{1}{3} = \frac{1}{3} \times \frac{2}{3} \times \frac{1}{3} \times \frac{1}{3}$$

$\textcircled{b}$

$$\textcircled{i} \quad 8x - 3 = \frac{-5x + 6}{-3}$$

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

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

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

$$x = 21$$

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

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

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

$$13x - 4 = 24x + 18$$

$$13x - 24x = 18 + 4$$

$$-11x = 22$$

$$x = -2$$

$$\textcircled{iii} \quad 2 \log(5x+3) = \log(x+1) + \log(x+2)$$

$$\log((5x+3)^2) = \log(x^2 + 2x + 2x + 2)$$

$$(5x+3)^2 = x^2 + 2x + x + 2$$

$$25x^2 + 30x + 9 = x^2 + 3x + 2$$

$$25x^2 + 30x + 9 - x^2 - 3x - 2 = 0$$

$$24x^2 + 27x + 7 = 0$$

$$x = \frac{-27 \pm \sqrt{27^2 - 4(24)(7)}}{2(24)}$$

$$x = \frac{-27 \pm \sqrt{729 - 672}}{48}$$

$$x = \frac{-27 \pm \sqrt{57}}{48}$$

$$x = \frac{-27 \pm \sqrt{57}}{48}$$

$$x = \frac{-27 \pm \sqrt{57}}{48}$$

$$x = -4052$$

$\textcircled{iv}$

$$7^x + 3^{x+2} = 5^{x-1}$$

$$7^x \cdot 3^2 \cdot 3^x = 5^x \cdot 5^{-1}$$

$$7^x \cdot 3^2 \cdot 3^x = 5^x \cdot \frac{1}{5}$$

$$(7 \cdot 3)^2 \cdot 9 = \frac{1}{5} \cdot 5^x$$

$$21^2 \cdot 9 = \frac{1}{5} \cdot 5^x$$

$$9 \cdot 21^2 = \frac{1}{5} \cdot 5^x$$

$$9 \cdot 21^2 = \frac{1}{5} \cdot 5^x$$

$$\left(\frac{21}{5}\right)^x = \frac{1}{45}$$

$$x = -\log_{\frac{21}{5}}(45)$$

$$x = 2.65$$

(c) i) $21R^2 + 24R + 5$
 $(4r+5)(3r+1)$

ii) $81Q^2 - 144Q + 64$
 $9(3Q+4Q)(3Q-4Q)$

iii) $6r - 6y + ur - uy$
 $(6+y)(r-y)$

iv) $x^2 + 9x + 8 = 0$
 $(x+8)(x+1) = 0$
 $x+8=0$ $x+1=0$
 $x=-8$ $x=-1$

ii) $17x^2 - 5x - 3 = 0$
 $17x^2 + 4x - 4x - 3 = 0$
 $4x(3x+1) - 3(3x+1) = 0$
 $(3x+1)(4x-3) = 0$
 $3x+1=0$ $4x-3=0$
 $x = -\frac{1}{3}$ $x = \frac{3}{4}$

$x = 0.3$ $x = 0.75$

iii) $2x^2 + 17x = -30$
 $2x^2 + 17x + 30 = 0$
 $2x(x+6) + 5(x+6) = 0$
 $(x+6)(2x+5) = 0$
 $x+6=0$ $2x+5=0$
 $x=-6$ $x = -\frac{5}{2}$

$x = 2.5$

iv) $x^2 - 256 = 0$
 $x^2 = 256$

$\sqrt{256} = 16$
 $x = \pm 16$ $x = 16$

e) $(x+5)^2 - x^2 - 32 = (x+1)$
 $(x+5)^2 - x^2 - 32 = (x+1)(x+2) - x^2$
 $x^2 + 10x + 25 - 32 = x^2 + 3x + 2 - x^2$
 $10x + 25 - 32 = 3x + 2$
 $10x - 7 = 3x + 2$
 $10x - 3x = 2 + 7$
 $7x = 9$
 $x = \frac{9}{7}$

$x = 1.285714$

Q 2

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

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

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

~~$$\frac{dy}{dx} =$$~~

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

$$\frac{dy}{dx} = 60x - 23x + 3$$

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

$$y = 3x^{-\frac{1}{2}} + \ln x$$

$$\frac{dy}{dx} = -\frac{3}{2}x^{-\frac{3}{2}} + \frac{1}{x}$$

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

~~$$\frac{dy}{dx} = 5 \cos \frac{\pi}{2} - 6 \sin 3x - 6 \cos \frac{\pi}{3}$$~~

$$\frac{dy}{dx} = 5 \cos \frac{\pi}{2} + 18 \sin 3x + \frac{1}{3} \sec^2 \frac{\pi}{3}$$

$$b) y = \sin 2x$$

$$\frac{dy}{dx} = 2 \cos 2x$$

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

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

$$\frac{d^4y}{dx^4} = 16 \sin(2x)$$