

Analytical methods
ACHA4000 / ACMA 4006
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exam
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D) a) $V_{min} = \sqrt{\frac{W}{S} \times \frac{2}{P} \times \frac{1}{C_L}}$

~~$200 = \frac{490332}{S} \times \frac{2}{0.41} \times \frac{1}{0.52}$~~

$$V_{min}^2 = \frac{W}{S} \times \frac{2}{P} \times \frac{1}{C_L}$$

$$V_{min}^2 S = W \times \frac{2}{P} \times \frac{1}{C_L}$$

$$S = \left(W \times \frac{2}{P} \times \frac{1}{C_L} \right) / V_{min}^2$$

$$\left(490332 \times \frac{2}{0.41} \times \frac{1}{0.52} \right) / 200^2 = S$$

$S = 1111.90$

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

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

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

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

$$x = 21$$

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

Common factor = 12

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

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

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

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

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

$$-22 = 37x$$

$$x = \frac{-22}{37}$$

$$37$$

$$x = -0.594$$

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

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

$$(5x+3)(5x+3) = (x+1)(x+2)$$

$$25x^2 + 15x + 15x + 9 = x^2 + 2x + x + 2$$

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

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

a b c

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

$$x = (27) \pm \frac{\sqrt{(729) + (672)}}{48}$$

$$x = (27 \pm \sqrt{57})$$

48

$$x = \frac{27 + 7.55}{48}$$

$$= 0.72$$

$$x = \frac{27 - 7.55}{48}$$

$$= 0.41$$

~~$$\begin{array}{r} 27R^2 + 24R + 5 \\ (9R + 5)(3R + 1) \end{array}$$~~

~~$$81R^2 - 144R^2$$~~

$$\text{c) } 27R^2 + 24R + 5$$

$$(9R + 5)(3R + 1)$$

$$\text{iii)} \quad \begin{array}{l} tr - ty + ur - uy \\ (t+u)(r-y) \end{array}$$

$$\text{d)} \quad \begin{array}{l} x^2 + 9x + 8 = 0 \\ (x+8)(x+1) \\ x^2 + x + 8x + 8 \\ x^2 + 9x + 8 = 0 \end{array}$$

$$\boxed{\begin{array}{l} x+8=0 \\ x=-8 \end{array}}$$

$$\boxed{\begin{array}{l} x+1=0 \\ x=-1 \end{array}}$$

$$\text{ii)} \quad 12x^2 - 5x - 3 = 0$$

$$(4x-3)(3x+1) = 0$$

$$4x-3=0 \quad \text{or} \quad 3x+1=0$$

$$x = \frac{3}{4} \quad \text{or} \quad x = -\frac{1}{3}$$

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

$$2x^2 + 17x - (-30) = 30 - (-30)$$

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

$$2x + 5 = 0 \quad \text{or} \quad x + 6 = 0$$

$$x = -\frac{5}{2} \quad \text{or} \quad x = -6$$

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

$$x^2 - 256 + 256 = 0 + 256$$