QUESTION 1

a $\dfrac{(2\cdot42)^2}{6\cdot18-3\cdot45} \neq 2\cdot15$

b $(a-2)(2a-1)$

c $\left.\begin{aligned} y &= 4x-3 \\ 6x-2y+2 &= 0 \end{aligned}\right\} \Rightarrow \begin{aligned} 6x-2(4x-3)+2 &= 0 \\ -2x+8 &= 0 \\ x &= 4 \\ y &= 13 \end{aligned}$ Solution $\therefore$ $(4,13)$

d 115% of Old Rate $= \$644$
$\therefore$ 1·15 $\times$ Old Rate = \$644 $\div$ 1·15
$\therefore$ Old Rate = \$560

e Pr (Meg wins both) = Pr (wins first) $\times$ Pr (wins second)
$= \dfrac{10}{200} \times \dfrac{9}{199}$
$= \dfrac{9}{3980}$

QUESTION 2

a **i** $\dfrac{d}{dx}\left\{5\left(3x^2-2x\right)^3\right\} = 15\left(3x^2-2x\right)^2.(6x-2)$

ii $\dfrac{d}{dx}\left\{x^2e^x\right\} = e^x\left(x^2+2x\right)$ PROD RULE

iii $\dfrac{d}{dx}\left\{\dfrac{2x}{1+x^2}\right\} = \dfrac{\left(1+x^2\right).2-2x.2x}{\left(1+x^2\right)^2}$

$= \dfrac{2-2x^2}{\left(1+x^2\right)^2}$

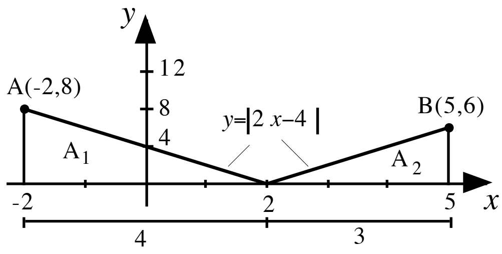
b **i** $\displaystyle\int_{0\cdot5}^{1}\left(\frac{3}{5x^2}+1\right).dx = \frac{-3}{5x}+x\,\Big|_{0\cdot5}^{1} = -\frac{3}{5}(1-2)+\left(1-\frac{1}{2}\right)$

$= 1\cdot10$ (2d.p.)

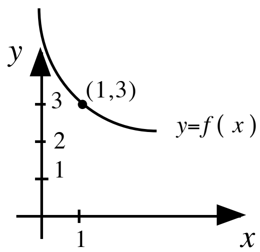
ii $\int_{-2}^{5} |2x-4|.dx = A_1 + A_2$

$= 16 + 9$

$= 25 \cdot 00 \ (2 \text{ dp})$

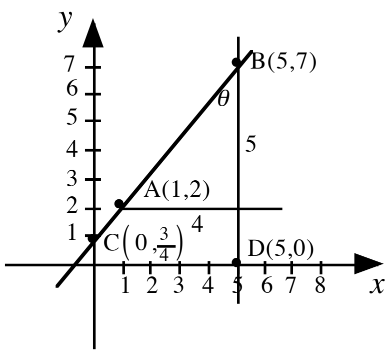


c



QUESTION 3

a i



ii Slope of AB $= \frac{5}{4}$ $\therefore$ Equation AB is $y - 2 = \frac{5}{4}(x-1)$

$4y - 8 = 5x - 5$

$5x - 4y + 3 = 0$

iii $\tan\theta = \frac{4}{5}$ (see diag) $\therefore$ $\theta \neq 38°40'$ (nearest $1'$)

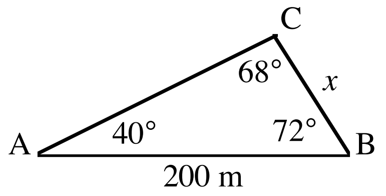
iv Coords of C $x = 0$ $-4y + 3 = 0,\ y = \frac{3}{4}$ $\therefore$ $C\left(0, \frac{3}{4}\right)$

v D(5,0)

vi BCOD is a trapezium Area $= \frac{1}{2}\left(\frac{3}{4} + 7\right) \times 5 = 19\frac{3}{8}u^2$

vii Inequalities $5x - 4y + 3 \le 0,\ 0 \le x \le 5,\ y \ge 0$

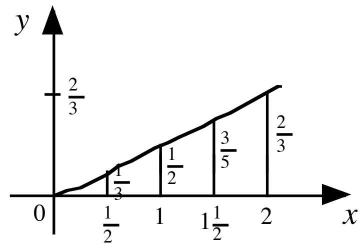
b



$$\frac{x}{\sin 40^\circ} = \frac{200}{\sin 68^\circ} \times \sin 40^\circ$$
$$\neq 138{\cdot}65\,(2\text{ dp})$$
$$\neq 139\text{ m}\,(\text{nearest m})$$

QUESTION 4

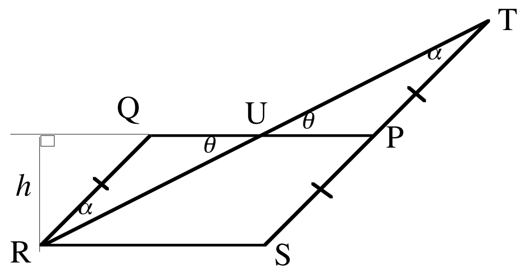
a $\int_0^2 \frac{x}{x+1}.dx \neq$ base × height



TRAPEZOIDAL RULE $\neq \frac{\frac{1}{2}}{2}\left[1\times 0 + 2\times\frac{1}{3} + 2\times\frac{1}{2} + 2\times\frac{3}{5} + \frac{2}{3}\right]$

$\neq \frac{53}{60} \quad \neq 0{\cdot}88\,(2\text{dp})$

b i



SP = PT (given)
SP = RQ (opp sides//gram)
∴ PT = RQ (both = SP)

Proof: In Δ's RQU, TPU
RQ = PT (proved above)
$\theta = \angle QUR = \angle TUP$ (vert opp)
$\alpha = \angle QRU = \angle PTU$ (alt & QR//TS)

∴ ΔRQU ≡ ΔTPU (A.A.S.)
∴ QU = PU (corresponding sides in cong Δ's)

ii Now Area $\Delta RQU = \frac{1}{2}QU \times h$
$= 4u^2$

Area $PQRS = QP \times h$
$= 2QU \times h$
$= 4\left(\frac{1}{2}QU \times h\right)$
$= 16u^2$

c Pr (at least 1 six) $= 1 - \text{Pr}(\text{no six})$

$$= 1 - \frac{5}{6} \times \frac{5}{6}$$

$$= \frac{11}{36}$$

QUESTION 5

a $A_{10} = P\left(1 + \frac{r}{100}\right)^{10} = \$400\,(1{\cdot}06)^{10}$

$\neq \$716{\cdot}34$ (nearest 1¢)

b Value of 1st deposit at 10yrs $= \$400(1{\cdot}06)^{10}$

Value of 2nd deposit at 10yrs $= \$400(1{\cdot}06)^{9}$

Value of last deposit $= \$400(1{\cdot}06) - \textbf{(a)}$

$\therefore$ Value of Super is $S_{10} = \dfrac{400(1{\cdot}06)\left[(1{\cdot}06)^{10} - 1\right]}{1{\cdot}06 - 1}$

$\neq \$5589$ (nearest \$1)

c Series 5, 6, 7, ... $T_n = n + 4$

i $\therefore$ Number of logs in nth layer is $n + 4$

ii $S_n = \frac{n}{2}[T_1 + T_n] = \frac{n}{2}[5 + n + 4]$

$$= \frac{n}{2}(n + 9)$$

QUESTION 6

a **i** $f(x) = 3x^4 - 4x^3 + 2$ has turning points when $f'(x) = 0$ ie $12x^3 - 12x^2 = 0$

$$12x^2(x - 1) = 0$$

$$x = 1 \text{ or } 0$$

$f''(x) = 36x^2 - 24x$ when $x = 0$, $f''(0) = 0$ and $f''\left(0^+\right) > 0$, $f''\left(0^-\right) < 0$

$\therefore$ Point (0,2) is a point of inflexion

when $x = 1$, $f''(1) > 0$ $\therefore$ point (1,1) is a minimum

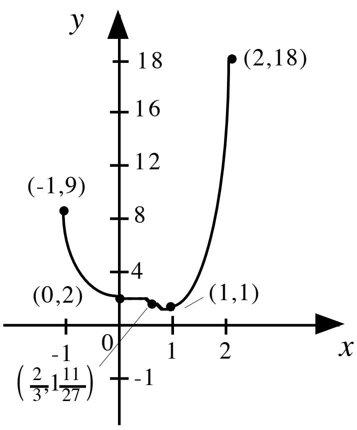
$\therefore$ Only turning point is minimum at (1,1)

ii $f''(x) = 36x^2 - 24x$ $\therefore$ have inflexion points at (0,2), (see above part (**i**)) and $\left(\frac{2}{3}, 1\frac{11}{27}\right)$

$= 12x(3x - 2)$

QUESTION 6 (cont)

a iii



iv Curve is concave down for $0 < x < \frac{2}{3}$

b $2\sin(3\theta)+2=1$ $\quad\sin(3\theta)=-\frac{1}{2}$ $\quad$ base $\angle = 30°$

$\therefore\ 3\theta = 210°, 330°, 570°, 690°, 930°, 1050°$

$\theta = 70°$ or $110°, 190°, 230°, 310°, 350°$

QUESTION 7

a $2x^2+4x-5=0$ has roots α and β $\quad$ **i** -2 $\quad$ **ii** $-\frac{5}{2}$ $\quad$ **ii** $\frac{\alpha+\beta}{\alpha\beta}=\frac{4}{5}$

iv $(\alpha+\beta)+(\beta+1)=0,\ (\alpha+\beta)+(\beta+1)=\alpha\beta+(a+\beta)+1$

$=-3\frac{1}{2}$

$\therefore$ Equation with roots $\alpha+1, \beta+1$ is $x^2-3\frac{1}{2}=0$

b $y \le 1$ or $y > 3$

c Cannot construct Δ because $3+4<8$ and the sum of any two sides of Δ must be greater than largest side.