

MCR  
3U

Exam review/prep from text

① pg 154 # 8, 11ab

8  $h(t) = -5t^2 + 20t + 50$

a)  $t = \frac{-20}{2(-5)} \quad h(2) = -5(2)^2 + 20(2) + 50$   
 $= 70$

$t = 2$

$\therefore$  max height 70m @  $t = 2s$

c) 50 m

11a)  $P(x) = -5x^2 + 400x - 2550$

b)  $x = \frac{-400}{2(-5)} \quad P(40) = -5(40)^2 + 400(40) - 2550$   
 $= \$5450$

$x = 40$   $\therefore$  max profit is \$5450 000 when \$40 000 spent on advertising.

pg 203 # 15

15.  $h(t) = -5t^2 + 14t$

$t = \frac{-14}{2(-5)} \quad h(1.4) = -5(1.4)^2 + 14(1.4)$   
 $= 9.8 \text{ m}$

$t = 1.4$

max height is  
9.8 m

$\therefore$  yes it can  
reach 9m

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pg 192 # 4cd, 9

4c)  $y = a(x-s)(x-t)$

$3 = a(-5-\sqrt{7})(-5+\sqrt{7})$

$3 = a(25 - 5\sqrt{7} + 5\sqrt{7} - \sqrt{49})$

$3 = a(25 - 7)$

$3 = \frac{18a}{18}$

$18 \quad 18$

$a = \frac{1}{6}$

$\therefore y = \frac{1}{6}(x-\sqrt{7})(x+\sqrt{7})$

pg 178 #7

$$7. \quad h(t) = -4.9t^2 + 6t + 0.6$$

$$0 = -4.9t^2 + 6t + 0.6$$

$$t = \frac{-6 \pm \sqrt{(6)^2 - 4(-4.9)(0.6)}}{2(-4.9)}$$

$$t = \cancel{-0.09s} \quad t = 1.32s \quad \leftarrow \text{time to hit the ground.}$$

another good practice question!

$$13. \quad h(t) = -4.9t^2 + 92t + 9$$

$$a) \quad 150 = -4.9t^2 + 92t + 9$$

$$0 = -4.9t^2 + 92t - 141$$

$$t = \frac{-92 \pm \sqrt{(92)^2 - 4(-4.9)(-141)}}{2(-4.9)}$$

$$t = 1.68s \quad t = 17.09s$$

$$b) \quad \text{above 150 m for } t = 17.09 - 1.68 \\ t = 15.41 \text{ seconds}$$



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4d)  $y = a(x-s)(x-t)$

$$4 = a(2 - (1 - \sqrt{2}))(2 - (1 + \sqrt{2}))$$

$$4 = a(2 - 1 + \sqrt{2})(2 - 1 - \sqrt{2})$$

$$4 = a(1 + \sqrt{2})(1 - \sqrt{2})$$

$$4 = a(1 - \sqrt{2} + \sqrt{2} - \sqrt{4})$$

$$4 = a(1 - 2)$$

$$\frac{4}{-1} = \frac{-1a}{-1}$$

$$a = -4$$

$$\therefore y = -4(x - 1 + \sqrt{2})(x - 1 - \sqrt{2})$$

9.  $y = a(x-s)(x-t)$

$$5 = a(-4 - 2 - \sqrt{3})(-4 - 2 + \sqrt{3})$$

$$5 = a(-6 - \sqrt{3})(-6 + \sqrt{3})$$

$$5 = a(36 - 3)$$

$$\frac{5}{33} = \frac{33a}{33}$$

$$a = 5/33$$

$$\therefore y = \frac{5}{33}(x - 2 - \sqrt{3})(x - 2 + \sqrt{3})$$

2

pg 10 # 1, 2 b-f

1 a) function - no repetition of x values

b) not - x value 1 has 2 diff. y values

c) not - x value 0 has 2 diff. y values

d) function - no repetition of x values

2 b) not c) yes d) not e) yes f) not

pg 23 # 4

4 a)  $f(-1) = (-1 - 2)^2 - 1$   $f(3) = (3 - 2)^2 - 1$

$$= (-3)^2 - 1$$

$$= 8$$

$$= 1^2 - 1$$

$$= 0$$

$$b) f(-1) = 2 + 3(-1) - 4(-1)^2 = -5 \quad f(3) = 2 + 3(3) - 4(3)^2 = -25$$

pg 35 # 2b-e

$$2b) \{x | x \in \mathbb{R}\} \quad c) \{x | x \in \mathbb{R}\}$$

$$\{y | y \in \mathbb{R}\} \quad \{y | y \neq 8, y \in \mathbb{R}\}$$

$$d) \{x | -5 \leq x \leq 5, x \in \mathbb{R}\} \quad e) \{x | x \leq 6, x \in \mathbb{R}\}$$

$$\{y | -5 \leq y \leq 5, y \in \mathbb{R}\} \quad \{y | y \geq -2, y \in \mathbb{R}\}$$

(3)

pg 47 # bdf

$$6d) f(x) = -\frac{1}{5}x - 2$$

$$y = -\frac{1}{5}x - 2$$

$$x = -\frac{1}{5}y - 2$$

$$x + 2 = -\frac{1}{5}y$$

$$\frac{5(x+2)}{-1} = \frac{-1y}{-1}$$

$$-5(x+2) = y$$

$$\therefore f^{-1}(x) = -5(x+2)$$

$$f) f(x) = \frac{x-3}{4}$$

$$y = \frac{x-3}{4}$$

$$x = \frac{y-3}{4}$$

$$4x = y - 3$$

$$4x + 3 = y$$

$$\therefore f^{-1}(x) = 4x + 3$$

pg 113 # 5bdef

$$5b) \frac{x^2 - 9}{15 - 5x} = \frac{x+3}{-5}, x \neq 3$$

$$= \frac{(x-3)(x+3)}{-5(x-3)}$$



$$\begin{aligned}
 5d) \quad & \frac{-p^2+3p+10}{-p^2+25} \\
 & = \frac{-1(p^2-3p-10)}{-1(p^2-25)} \\
 & = \frac{(p-5)(p+2)}{(p-5)(p+5)} \\
 & = \frac{p+2}{p+5}, \quad p \neq \pm 5
 \end{aligned}$$

$$\begin{aligned}
 e) \quad & \frac{t^2-7t+12}{t^3-6t^2+9t} \\
 & = \frac{(t-3)(t-4)}{t(t^2-6t+9)} \\
 & = \frac{(t-3)(t-4)}{t(t-3)(t-3)} \\
 & = \frac{t-4}{t(t-3)}, \quad t \neq 0, 3
 \end{aligned}$$

$$\begin{aligned}
 f) \quad & \frac{6t^2-t-2}{2t^2-t-1} \\
 & = \frac{(2t+1)(3t-2)}{(2t+1)(t-1)} \\
 & = \frac{3t-2}{t-1}, \quad t \neq -\frac{1}{2}, 1
 \end{aligned}$$

pg 122 # 6d

$$\begin{aligned}
 6c) \quad & \frac{2x^2-x-1}{x^2-x-6} \times \frac{6x^2-5x+1}{8x^2+14x+5} \\
 & = \frac{(2x+1)(x-1)}{(x-3)(x+2)} \times \frac{(2x-1)(3x-1)}{(4x+5)(2x+1)} \\
 & = \frac{(x-1)(2x-1)(3x-1)}{(x-3)(x+2)(4x+5)}, \quad x \neq 3, -2, -\frac{5}{4}, -\frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 d) \quad & \frac{9y^2-4}{4y-12} \div \frac{9y^2+12y+4}{18-6y} \\
 & = \frac{(3y-2)(3y+2)}{4(y-3)} \times \frac{-6(y-3)}{(3y+2)(3y+2)} \\
 & = \frac{-3(3y-2)}{2(3y+2)}, \quad y \neq 3, -\frac{2}{3}
 \end{aligned}$$

pg 161 # 10ac

$$\begin{aligned} 10a) \quad h(t) &= -5t^2 + 10t + 35 \\ &= -5(t^2 - 2t) + 35 \\ &= -5(t^2 - 2t + 1 - 1) + 35 \\ h(t) &= -5(t-1)^2 + 40 \end{aligned}$$

$$\begin{aligned} c) \quad h &= -5(t-1)^2 + 40 \\ \frac{h-40}{-5} &= (t-1)^2 \\ | \pm \sqrt{\frac{h-40}{-5}} &= t \end{aligned}$$

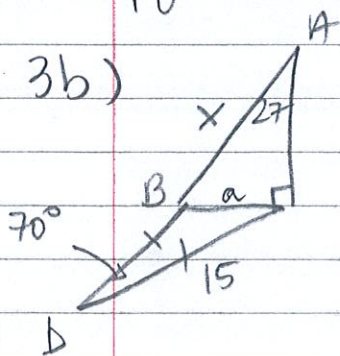
pg 168 # 6be

$$\begin{aligned} 6b) \quad &\sqrt{12} + \sqrt{18} - \sqrt{27} + \sqrt{50} \\ &= 2\sqrt{3} + 3\sqrt{2} - 3\sqrt{3} + 5\sqrt{2} \\ &= -1\sqrt{3} + 8\sqrt{2} \end{aligned}$$

$$\begin{aligned} e) \quad &-5\sqrt{45} + \sqrt{52} + 3\sqrt{125} \\ &= -15\sqrt{5} + 2\sqrt{13} + 15\sqrt{5} \\ &= 2\sqrt{13} \end{aligned}$$

(4)

pg 332 # 3b



$$\begin{aligned} a^2 &= 15^2 + 15^2 - 2(15)(15)\cos 70 \\ a &= 17.2 \text{ cm} \end{aligned}$$

$$\sin 27 = \frac{17.2}{x}$$

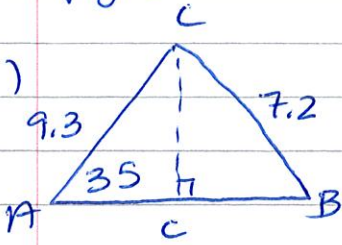
$$x = \frac{17.2}{\sin 27}$$

$$x = 37.9 \text{ cm} \quad \therefore 38 \text{ m}$$



pg 318 #5ad

5a)



SSA  $\therefore$  check height  $h = 9.3 \sin 35$   
 $h = 5.3$

Since  $h < 7.2 < 9.3 \therefore$  two solutions for  $c$

Case 1

$$\frac{\sin B}{9.3} = \frac{\sin 35}{7.2}$$

$$B = \sin^{-1}\left(\frac{9.3 \sin 35}{7.2}\right)$$

$$B = 47.8^\circ \Rightarrow 48$$

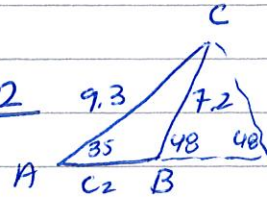
$$\therefore C = 97.2^\circ \Rightarrow 97$$

$$\frac{c}{\sin 97} = \frac{7.2}{\sin 35}$$

$$c = \frac{7.2 \sin 97}{\sin 35}$$

$$c = 12.5 \text{ mm}$$

Case 2



$$B = 132^\circ$$

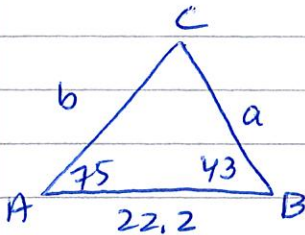
$$C = 13^\circ$$

$$\frac{c_2}{\sin 13} = \frac{7.2}{\sin 35}$$

$$c_2 = \frac{7.2 \sin 13}{\sin 35}$$

$$c_2 = 2.8 \text{ mm}$$

d)



$$C = 62^\circ \quad \frac{a}{\sin 75} = \frac{b}{\sin 43} = \frac{22.2}{\sin 62}$$

$$a = \frac{22.2 \sin 75}{\sin 62}$$

$$a = 24.3 \text{ cm}$$

$$b = \frac{22.2 \sin 43}{\sin 62}$$

$$b = 17.1 \text{ cm}$$





$$\begin{aligned}
 8c) \quad LS &= \cos^4 \theta & RS &= (1 - \sin \theta)(1 + \sin \theta) \\
 & & &= 1 - \sin^2 \theta \\
 & & &= \cos^2 \theta
 \end{aligned}$$

$$\begin{aligned}
 d) \quad LS &= \sin^2 \theta + 2\cos^2 \theta - 1 & RS &= \cos^2 \theta \\
 &= 1 - \cos^2 \theta + 2\cos^2 \theta - 1 \\
 &= \cos^2 \theta
 \end{aligned}$$

$$\begin{aligned}
 e) \quad LS &= \sin^4 \theta - \cos^4 \theta & RS &= \sin^2 \theta - \cos^2 \theta \\
 &= (\sin^2 \theta - \cos^2 \theta)(\sin^2 \theta + \cos^2 \theta) \\
 &= (\sin^2 \theta - \cos^2 \theta)(1) \\
 &= \sin^2 \theta - \cos^2 \theta
 \end{aligned}$$

$$\begin{aligned}
 f) \quad LS &= \tan \theta + \frac{1}{\tan \theta} & RS &= \frac{1}{\sin \theta \cos \theta} \\
 &= \frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} \\
 &= \frac{\sin^2 \theta + \cos^2 \theta}{\sin \theta \cos \theta} \\
 &= \frac{1}{\sin \theta \cos \theta}
 \end{aligned}$$

⑥ rj 229 # 2 acf

$$\begin{aligned}
 2a) \quad & \sqrt[9]{512} \\
 &= 512^{1/9} \\
 &= 2
 \end{aligned}$$

$$\begin{aligned}
 c) \quad & \sqrt[3]{27^2} \\
 &= 27^{2/3} \\
 &= 9
 \end{aligned}$$

$$\begin{aligned}
 f) \quad & \sqrt[4]{\left(\frac{16}{81}\right)^{-1}} \\
 &= \left(\frac{16}{81}\right)^{-1/4} \\
 &= \left(\frac{81}{16}\right)^{1/4} \\
 &= \frac{3}{2}
 \end{aligned}$$

Pg 235 #1

1 a)  $x^7$  c)  $m^8$  e)  $y^6$

b)  $b^2$  d)  $\frac{1}{a^2}$  f)  $\frac{1}{k^{12}}$

Pg 236 #5 d f b d f

$$\begin{aligned} 5d) & \left( \frac{3m^4 n^2}{12m^{-2} n^6} \right)^2 \\ &= \frac{3^2 m^8 n^4}{12 m^{-2} n^6} \\ &= \frac{9 m^{10}}{12 n^2} \\ &= \frac{3m^{10}}{4n^2} \end{aligned}$$

$$\begin{aligned} f) & \left( \frac{(x^3 y)^{-1} (x^4 y^3)}{(x^2 y^{-3})^{-2}} \right)^{-1} \\ &= \left( \frac{(x^{-3} y^{-1}) (x^4 y^3)}{x^{-4} y^6} \right)^{-1} \\ &= \left( \frac{x^1 y^2}{x^{-4} y^6} \right)^{-1} \\ &= \left( \frac{x^5}{y^4} \right)^{-1} \\ &= \frac{y^4}{x^5} \end{aligned}$$

$$\begin{aligned} 6d) & \sqrt[3]{\frac{(10x^3)^2}{(10x^6)^{-1}}} \\ &= \left( \frac{10^2 x^6}{10^{-1} x^{-6}} \right)^{1/3} \\ &= \left( 10^3 x^{12} \right)^{1/3} \\ &= 10x^4 \end{aligned}$$

$$\begin{aligned} f) & \frac{\sqrt[10]{1024x^{20}}}{\sqrt[9]{512x^{27}}} \\ &= \frac{(1024x^{20})^{1/10}}{(512x^{27})^{1/9}} \\ &= \frac{1024^{1/10} x^2}{512^{1/9} x^3} \\ &= \frac{2x^2}{2x^3} \\ &= \frac{1}{x} \end{aligned}$$



7) pg 469 # 15ac 22ab

$$15a) \begin{array}{l} a=24 \\ d=11 \end{array} \quad S_{25} = \frac{25}{2} (2(24) + (25-1)(11))$$
$$= 3900$$

$$c) \begin{array}{l} t_1=84 \\ t_2=57 \end{array} \quad \begin{array}{l} a=84 \\ d=-27 \end{array} \quad S_{25} = \frac{25}{2} (2(84) + (24)(-27))$$
$$= -6000$$

$$22a) 7+14+28+\dots+3584$$
$$\begin{array}{l} a=7 \\ r=2 \\ t_n=3584 \end{array} \quad \begin{array}{l} 3584 = \frac{7(2)^n - 7}{2-1} \\ 512 = 2^{n-1} \\ \frac{\log 512}{\log 2} + 1 = n \\ 10 = n \end{array} \quad S_{10} = \frac{7(2^{10} - 1)}{2-1}$$
$$= 7161$$

$$b) -3 - 6 - 12 - \dots - 768$$
$$\begin{array}{l} a=-3 \\ r=2 \\ t_n=-768 \end{array} \quad \begin{array}{l} -768 = \frac{-3(2)^n - 3}{2-1} \\ 256 = 2^{n-1} \\ \frac{\log 256}{\log 2} + 1 = n \\ 9 = n \end{array} \quad S_9 = \frac{-3(2^9 - 1)}{2-1}$$
$$= -1533$$