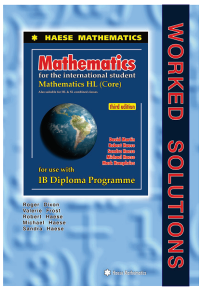


ERRATA

MATHEMATICS FOR THE INTERNATIONAL STUDENT

MATHEMATICS HL (Core) third edition - WORKED SOLUTIONS

Third edition - 2014 first reprint

The following erratum was made on 05/May/2020

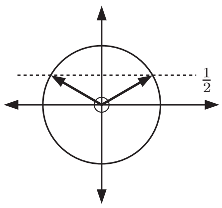
page 918 **EXERCISE 27A** question **79**, answer should read:

79 $3\sec 2x = \cot 2x + 3\tan 2x, \quad -\pi \leqslant x \leqslant \pi$

$\therefore \dfrac{3}{\cos 2x} = \dfrac{\cos 2x}{\sin 2x} + 3\dfrac{\sin 2x}{\cos 2x}, \quad -2\pi \leqslant 2x \leqslant 2\pi, \quad \cos 2x,\ \sin 2x \neq 0$

Multiplying all terms by $\sin 2x \cos 2x$ gives:

$$3\sin 2x = \cos^2 2x + 3\sin^2 2x$$
$$\therefore\ 3\sin 2x = 1 - \sin^2 2x + 3\sin^2 2x$$
$$\therefore\ 2\sin^2 2x - 3\sin 2x + 1 = 0$$
$$\therefore\ (2\sin 2x - 1)(\sin 2x - 1) = 0$$
$$\therefore\ \sin 2x = \tfrac{1}{2} \quad \{\sin 2x \neq 1 \text{ otherwise } \cos 2x = 0\}$$
$$\therefore\ 2x = \tfrac{-11\pi}{6}, \tfrac{-7\pi}{6}, \tfrac{\pi}{6}, \text{ or } \tfrac{5\pi}{6}$$
$$\therefore\ x = \tfrac{-11\pi}{12}, \tfrac{-7\pi}{12}, \tfrac{\pi}{12}, \text{ or } \tfrac{5\pi}{12}$$



The following errata were made on 29/Apr/2020

page 603 **EXERCISE 19A** question **8 c**, seventh line should give correct reason why $x = -2$:

8 **b** $f(x) = \dfrac{x}{\sqrt{2-x}}$

Now $f(x)$ is a quotient where

$u = x$ and $v = (2-x)^{\frac{1}{2}}$

$\therefore\ u' = 1$ and $v' = \frac{1}{2}(2-x)^{-\frac{1}{2}}(-1)$

Now $f'(x) = \dfrac{u'v - uv'}{v^2}$

$= \dfrac{1(2-x)^{\frac{1}{2}} - x\frac{1}{2}(2-x)^{-\frac{1}{2}}(-1)}{(2-x)^{\frac{2}{2}}}$

c $f(x) = \dfrac{x}{\sqrt{2-x}} = -1$

$\therefore\ x = -\sqrt{2-x}$

$\therefore\ x^2 = 2 - x$

$\therefore\ x^2 + x - 2 = 0$

$\therefore\ (x+2)(x-1) = 0$

$\therefore\ x = -2 \text{ or } 1$

but $f(1) = \dfrac{1}{\sqrt{2-1}} = 1$

$\therefore\ x = -2$

$\therefore$ the point of contact is $(-2, -1)$.

page 659 **EXERCISE 20B** question **18 b**, last line of each part should have correct units:

18 **b** **i** When $t = 0$,

$\sin t = 0$ and $\cos t = 1$

$\therefore\ \dfrac{dx}{dt} = 0 + 0$

$= 0$ m per radian

ii When $t = \frac{\pi}{2}$,

$\sin t = 1$ and $\cos t = 0$

$\therefore\ \dfrac{dx}{dt} = 0 + \sin(\frac{\pi}{2})$

$= 1$ m per radian

iii When $t = \frac{2\pi}{3}$,

$\sin t = \frac{\sqrt{3}}{2}$ and $\cos t = -\frac{1}{2}$

$\therefore\ \dfrac{dx}{dt} = \dfrac{-\frac{\sqrt{3}}{2}(-\frac{1}{2})}{\sqrt{4 - \frac{3}{4}}} + \dfrac{\sqrt{3}}{2}$

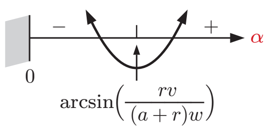
≈ 1.11 m per radian

page 689 **REVIEW SET 20C** question **10 c**, sign diagram should read:

10 **c** Now $a + r \neq 0$ so $\dfrac{dT}{d\theta} = 0$ when $\sin\alpha - \dfrac{rv}{(a+r)w} = 0$

$\therefore\ \sin\alpha = \dfrac{rv}{(a+r)w}$

Sign diagram for $\dfrac{dT}{d\theta}$ is:



$\therefore\ T$ is minimised when $\sin\alpha = \dfrac{rv}{(a+r)w}$

The following erratum was made on 21/Feb/2020

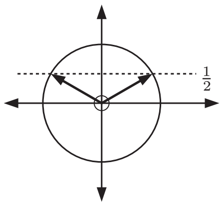
page 918 **EXERCISE 27A** question **79,** last three lines and diagram should read:

79 $3\sec 2x = \cot 2x + 3\tan 2x, \quad -\pi \leqslant x \leqslant \pi$

$\therefore \quad \dfrac{3}{\cos 2x} = \dfrac{\cos 2x}{\sin 2x} + 3\dfrac{\sin 2x}{\cos 2x}, \quad -2\pi \leqslant 2x \leqslant 2\pi$

Multiplying all terms by $\sin 2x \cos 2x$ gives:

$$3\sin 2x = \cos^2 2x + 3\sin^2 2x$$
$$\therefore \quad 3\sin 2x = 1 - \sin^2 2x + 3\sin^2 2x$$
$$\therefore \quad 2\sin^2 2x - 3\sin 2x + 1 = 0$$
$$\therefore \quad (2\sin 2x - 1)(\sin 2x - 1) = 0$$
$$\therefore \quad \sin 2x = \tfrac{1}{2} \quad \{\sin 2x \neq 1 \text{ otherwise } \cos 2x = 0\}$$
$$\therefore \quad 2x = \tfrac{-11\pi}{6}, \tfrac{-7\pi}{6}, \tfrac{\pi}{6}, \text{ or } \tfrac{5\pi}{6}$$
$$\therefore \quad x = \tfrac{-11\pi}{12}, \tfrac{-7\pi}{12}, \tfrac{\pi}{12}, \text{ or } \tfrac{5\pi}{12}$$



The following erratum was made on 20/Dec/2019

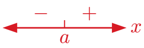
page 264 **REVIEW SET 8C** question **5,** second line should read:

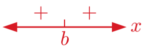
5 In the expansion of $\left(2x^2 - \dfrac{1}{x}\right)^6$, $\quad a = 2x^2, \; b = -\dfrac{1}{x}, \; n = 6$

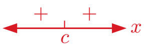
$T_{r+1} = \binom{n}{r} a^{n-r} b^r$ For the constant term we let $12 - 3r = 0$

The following errata were made on 15/May/2018

page 935 **EXERCISE 27A** question **123 a,** should include sign diagrams:

123 **a** $f'(x)$ near a has sign diagram 

$f'(x)$ near b has sign diagram  , but $f'(b) \neq 0$

$f'(x)$ near c has sign diagram  , but $f'(c) = 0$

page 937 **EXERCISE 27A** question **125 a,** should read:

125 **a** At any point $A(x, y)$, $\dfrac{dy}{dx} = \dfrac{y - 0}{x - \left(x - \frac{1}{2}\right)} = 2y$

$$\therefore \quad \frac{dx}{dy} = \frac{1}{2y}$$

The following erratum was made on 25/Jul/2017

page 631 **EXERCISE 19D.1** question **12 a ii,** should read:

12 $f(t) = Ate^{-bt}, \quad t \geqslant 0, \quad A, b > 0$

a **ii** $f''(t) = -Abe^{-bt} - (Abe^{-bt} - Ab^2te^{-bt})$ {product rule}

$= -2Abe^{-bt} + Ab^2te^{-bt}$

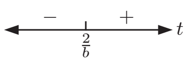
$= Abe^{-bt}(bt - 2)$

When $f''(t) = 0$ then $Abe^{-bt}(bt - 2) = 0$ but $A, b > 0$ and $e^{-bt} > 0$

$\therefore \quad bt - 2 = 0$

$\therefore \quad bt = 2$

$\therefore \quad t = \dfrac{2}{b}$

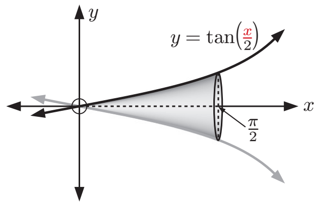
Sign diagram of $f''(t)$ is: 

$\therefore \quad t = \dfrac{2}{b}$ is a non-stationary point of inflection.

The following erratum was made on 13/Jun/2017

page 773 **EXERCISE 22E.1** question **10 f,** diagram should have correct function equation:

10 **f**



The following errata were made on 19/May/2017

pages 420 and 421 **EXERCISE 14K.1** question **7,** should read:

7
$$\mathbf{a} \times (\mathbf{b} + \mathbf{c}) = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ a_1 & a_2 & a_3 \\ b_1 + c_1 & b_2 + c_2 & b_3 + c_3 \end{vmatrix}$$
$$= \begin{vmatrix} a_2 & a_3 \\ b_2 + c_2 & b_3 + c_3 \end{vmatrix} \mathbf{i} - \begin{vmatrix} a_1 & a_3 \\ b_1 + c_1 & b_3 + c_3 \end{vmatrix} \mathbf{j} + \begin{vmatrix} a_1 & a_2 \\ b_1 + c_1 & b_2 + c_2 \end{vmatrix} \mathbf{k}$$
$$= (a_2(b_3 + c_3) - a_3(b_2 + c_2))\mathbf{i} - (a_1(b_3 + c_3) - a_3(b_1 + c_1))\mathbf{j} + (a_1(b_2 + c_2) - a_2(b_1 + c_1))\mathbf{k}$$
$$= (a_2b_3 + a_2c_3 - a_3b_2 - a_3c_2)\mathbf{i} - (a_1b_3 + a_1c_3 - a_3b_1 - a_3c_1)\mathbf{j} + (a_1b_2 + a_1c_2 - a_2b_1 - a_2c_1)\mathbf{k}$$

$$\mathbf{a} \times \mathbf{b} + \mathbf{a} \times \mathbf{c} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix} + \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ a_1 & a_2 & a_3 \\ c_1 & c_2 & c_3 \end{vmatrix}$$

$$\therefore \quad \mathbf{a} \times \mathbf{b} + \mathbf{a} \times \mathbf{c} = \begin{vmatrix} a_2 & a_3 \\ b_2 & b_3 \end{vmatrix} \mathbf{i} - \begin{vmatrix} a_1 & a_3 \\ b_1 & b_3 \end{vmatrix} \mathbf{j} + \begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix} \mathbf{k} + \begin{vmatrix} a_2 & a_3 \\ c_2 & c_3 \end{vmatrix} \mathbf{i} - \begin{vmatrix} a_1 & a_3 \\ c_1 & c_3 \end{vmatrix} \mathbf{j} + \begin{vmatrix} a_1 & a_2 \\ c_1 & c_2 \end{vmatrix} \mathbf{k}$$
$$= (a_2b_3 - a_3b_2)\mathbf{i} - (a_1b_3 - a_3b_1)\mathbf{j} + (a_1b_2 - a_2b_1)\mathbf{k} + (a_2c_3 - a_3c_2)\mathbf{i} - (a_1c_3 - a_3c_1)\mathbf{j} + (a_1c_2 - a_2c_1)\mathbf{k}$$
$$= (a_2b_3 + a_2c_3 - a_3b_2 - a_3c_2)\mathbf{i} - (a_1b_3 + a_1c_3 - a_3b_1 - a_3c_1)\mathbf{j} + (a_1b_2 + a_1c_2 - a_2b_1 - a_2c_1)\mathbf{k}$$
$$= \mathbf{a} \times (\mathbf{b} + \mathbf{c})$$

page 424 **EXERCISE 14K.2** question **2 c,** should read:

2 **c** $\sin^2\theta + \cos^2\theta = 1$

$$\therefore \quad \sin\theta = \pm\sqrt{1 - \cos^2\theta}$$
$$= \pm\sqrt{1 - \left(\frac{1}{\sqrt{28}}\right)^2}$$
$$= \pm\sqrt{\frac{27}{28}}$$

But since θ is the angle between two vectors,
$0° \leqslant \theta \leqslant 180°$.
$\therefore \quad \sin\theta \geqslant 0$
$\therefore \quad \sin\theta = \sqrt{\frac{27}{28}}$

The following erratum was made on 22/Mar/2017

page 422 **EXERCISE 14K.1** question **11,** last line should read:

11 ....

$$= \pm\frac{\sqrt{10}}{6}\begin{pmatrix} 4 \\ -5 \\ -7 \end{pmatrix}$$

The following erratum was made on 24/May/2016

page 506 **EXERCISE 16B.2** question **4 d,** diagram should have correct label:

4 **a** $z \mapsto z^*$. Reflection in the real axis.

b $z \mapsto -z$. Rotation of π about O.

c $z \mapsto -z^*$. Reflection in the imaginary axis.

d $z \mapsto -iz$. Clockwise rotation of $\frac{\pi}{2}$ about O.