

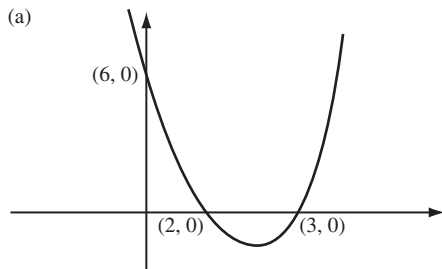
## Worked Solutions

### Edexcel C3 Paper A

1.  $fg(x) = g^{-1}g(x) = x.$  (3)

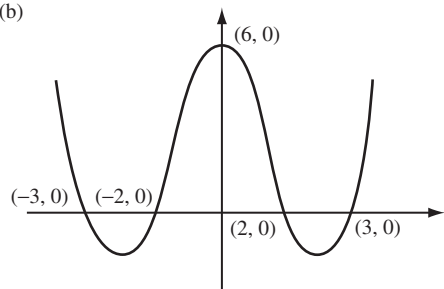
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2. (a)



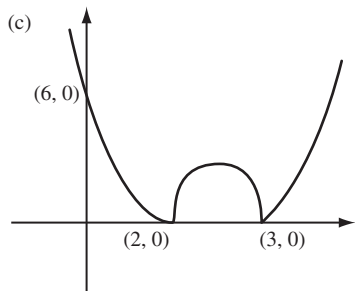
(2)

(b)



(3)

(c)



(3)

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3.  $e^{2x} - 7e^x + 12 = 0$

$$(e^x - 3)(e^x - 4) = 0$$

$$e^x = 3 \Rightarrow x = \ln 3$$

$$e^x = 4 \Rightarrow x = \ln 4$$

(6)

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4.  $\sin A = \frac{3}{5} \Rightarrow \cos A = -\frac{4}{5}$

$$\sin B = \frac{5}{13} \Rightarrow \cos B = -\frac{12}{13}$$

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$= \frac{3}{5} \cdot \frac{-12}{13} - \left(-\frac{4}{5}\right) \cdot \frac{5}{13} = -\frac{16}{65}$$

(2)

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$= \frac{-\frac{3}{4} - \frac{5}{12}}{1 - \left(-\frac{3}{4}\right)\left(-\frac{5}{12}\right)}$$

$$= \frac{-\frac{14}{12}}{\frac{11}{16}} = \frac{-56}{33}$$

(7)

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5.  $\frac{dy}{dx} = xe^x + e^x$

at turning point,  $(x + 1)e^x = 0 \Rightarrow x = -1$

$$y = -e^{-1} \quad \text{pt. } \left(-1, \frac{-1}{e}\right)$$

$$\frac{d^2y}{dx^2} = e^x + xe^x + e^x$$

$$x = -1 \quad \frac{d^2y}{dx^2} = e^{-1} > 0 \quad \therefore \text{minimum}$$

(8)

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$$6. (a) \quad \left. \begin{array}{l} f(1) = 1 - 6 + 7 = 2 \\ f(2) = 4 - 12 + 7 = -1 \end{array} \right\} \text{change of sign} \quad (2)$$

$$(b) \quad 7 = 6x - x^2 \quad (2)$$

$$7 = x(6 - x)$$

$$x = \frac{7}{6 - x} \quad (2)$$

$$(c) \quad x_1 = 1.75, \quad x_2 = 1.6470, \quad x_3 = 1.6081, \quad x_4 = 1.5938, \quad x_5 = 1.5886, \quad x_6 = 1.5868$$

$$\text{Ans. } x = 1.59 \text{ (3 s.f.)} \quad (3)$$

$$7. \quad \frac{dx}{dy} = -3 \sin 3y,$$

$$\frac{dy}{dx} = -\frac{1}{3 \sin 3y}$$

$$y = \frac{\pi}{6}, \quad \frac{dy}{dx} = -\frac{1}{3}$$

$$y = \frac{\pi}{6}, \quad x = 0.$$

$$y - \frac{\pi}{6} = -\frac{1}{3}(x - 0)$$

$$y - \frac{\pi}{6} = -\frac{1}{3}x$$

$$6y + 2x - \pi = 0 \quad (8)$$

$$8. (a) \quad \frac{3}{(x+2)(x+3)} - \frac{2}{x+3} = \frac{1}{x+2}$$

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

$$3 - 2x - 4 = x + 3$$

$$-4 = 3x$$

$$x = -\frac{4}{3} \quad (5)$$

$$(b) \quad \frac{(2x-3)(2x+3)}{(x+1)(x^2-x+1)} \times \frac{x+1}{(2x+3)(x-5)}$$

$$\frac{2x-3}{(x^2-x+1)(x-5)} \quad (4)$$

$$9. (a) \quad f(1) = 1 - 1 - 3 + 3 = 0.$$

$$(x-1)(x^2-3) = 0 \quad x = \pm\sqrt{3} \quad (4)$$

$$(b) \quad \tan^3 \theta - 3 \tan \theta + 4 = 1 + \tan^2 \theta$$

$$\tan^3 \theta - \tan^2 \theta - 3 \tan \theta + 3 = 0$$

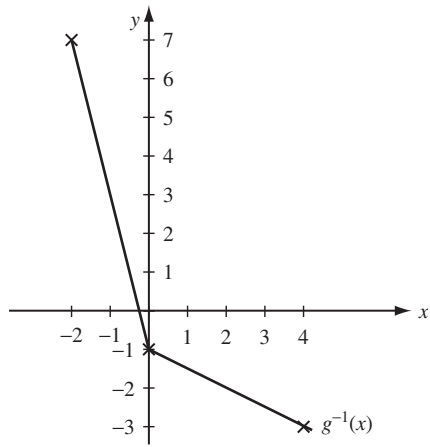
$$\text{same as (i) with } x = \tan \theta \quad (2)$$

$$(c) \quad \tan \theta = 1 \Rightarrow \theta = \frac{\pi}{4}$$

$$\tan \theta = \sqrt{3} \Rightarrow \theta = \frac{\pi}{3}$$

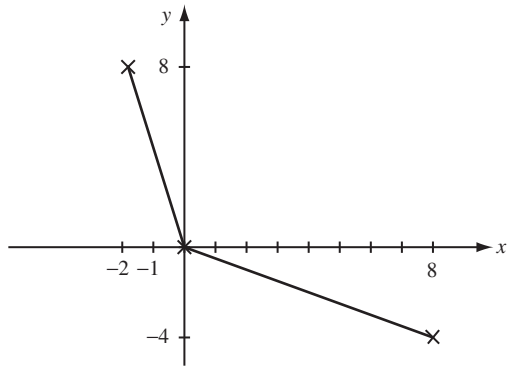
$$\tan \theta = -\sqrt{3} \Rightarrow \theta = \frac{2\pi}{3} \quad (4)$$

10. (a)



(3)

(b)



(3)

(c)  $g(-3) = 4$

$$hg(-3) = h(4)$$

$$= -2$$

(3)