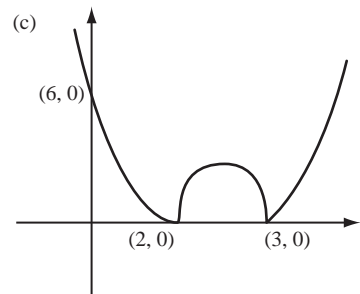
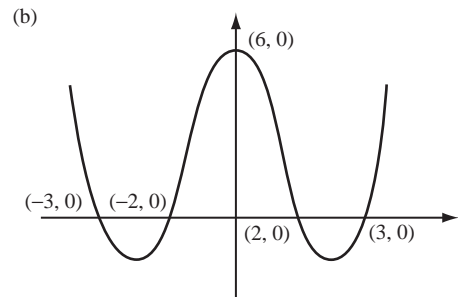
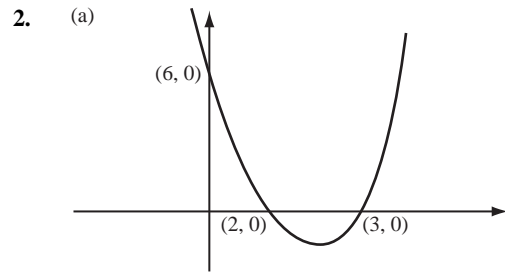


Worked Solutions

Edexcel C3 Paper A

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



(3)

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)

4. $\sin A = \frac{3}{5} \Rightarrow \cos A = -\frac{4}{5}$
 $\sin B = \frac{5}{13} \Rightarrow \cos B = -\frac{12}{13}$
 $\sin(A - B) = \sin A \cos B - \cos A \sin B$
 $= \frac{3}{5} \cdot \frac{-12}{13} - \frac{-4}{5} \cdot \frac{5}{13} = -\frac{16}{65}$
 $\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$
 $= \frac{-\frac{3}{4} - \frac{5}{12}}{1 - \left(-\frac{3}{4}\right)\left(-\frac{5}{12}\right)}$
 $= \frac{-\frac{14}{12}}{\frac{11}{16}} = \frac{-56}{33}$ (7)

5. $\frac{dy}{dx} = xe^x + e^x$
 at turning point, $(x + 1)e^x = 0 \Rightarrow x = -1$
 $y = -e^{-1}$ 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)

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

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

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

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

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

Ans. $x = 1.59$ (3 s.f.) (3)

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

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

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

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

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

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

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

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

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

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

$$-4 = 3x$$

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

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

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

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

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

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

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

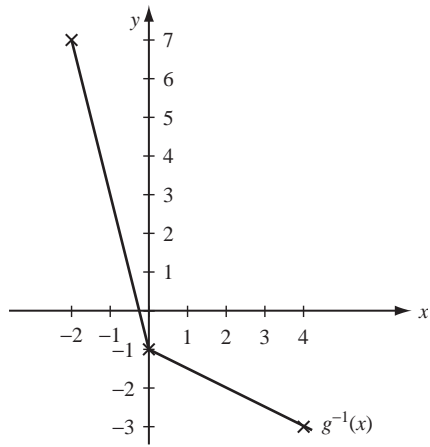
same as (i) with $x = \tan \theta$ (2)

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

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

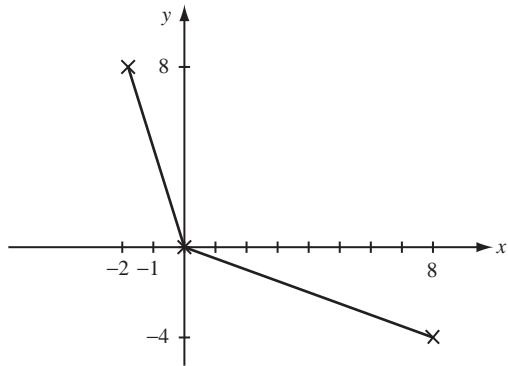
$$\tan \theta = -\sqrt{3} \Rightarrow \theta = \frac{2\pi}{3}$$
 (4)

10. (a)



(3)

(b)



(3)

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

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

$= -2$

(3)