

**Elmwood Press**  
**Core Mathematics C3**  
**Paper B**  
**(Mark Scheme)**

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## Worked Solutions

### Edexcel C3 Paper B

1. (a)  $\ln(3x + 7) = 1 \Rightarrow 3x + 7 = e \quad x = \frac{e - 7}{3}$  (3)

(b)  $2e^{2y} + 5e^y - 3 = 0$   
 $(2e^y - 1)(e^y + 3) = 0$   
 $e^y = \frac{1}{2} \Rightarrow y = \ln \frac{1}{2} \text{ (or } -\ln 2)$  (5)

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2. (a) any valid pair of  $A$  &  $B$  e.g.  $A = B = \pi/2$ . (2)

(b) L.H.S.  $= \frac{2}{\sin 2A} = \frac{2}{2 \sin A \cos A} = \operatorname{cosec} A \sec A$  (3)

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3. (a)  $\frac{2(x + 3) + 11}{(x - 5)(x + 3)} = \frac{2x + 17}{(x - 5)(x + 3)}$  (3)

(b)  $\frac{2x + 17}{x^2 - 2x - 15} = 1$   
 $2x + 17 = x^2 - 2x - 15$   
 $x^2 - 4x - 32 = 0$   
 $(x - 8)(x + 4) = 0$   
 $x = 8 \text{ or } -4$  (4)

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4. (a)  $y = k \ln x \quad \frac{y}{k} = \ln x$

$x = e^{\frac{y}{k}} \therefore f^{-1}(x) = e^{\frac{x}{k}}$  (3)

(b)  $gf(x) = e^{k \ln x} = e^{\ln x^k} = x^k$  (3)

(c)  $gf(2) = 16 \therefore 2^k = 16 \Rightarrow k = 4$ . (2)

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5.  $\sin x = \frac{3}{5}$ ,

$\cos^2 x + \sin^2 x = 1$

$\therefore \cos^2 x = 1 - \frac{9}{25} = \frac{16}{25}$

$\cos x = -\frac{4}{5} \therefore x \text{ is obtuse.}$

$\therefore \tan x = -\frac{3}{4}$

$\cot 2x = \frac{1}{\tan 2x} = \frac{1 - \tan^2 x}{2 \tan x}$

$= \frac{1 - \frac{9}{16}}{2 \left(-\frac{3}{4}\right)}$

$= \frac{\frac{7}{16}}{\frac{-3}{2}} = \frac{-7}{24}$  (7)

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6. (a)  $\frac{dy}{dx} = x \cdot 2e^{2x} + e^{2x} \cdot 1$

$\frac{dy}{dx} = 0, \quad (2x + 1)e^{2x} = 0$

$\Rightarrow x = -\frac{1}{2} \quad \text{pt. } \left(-\frac{1}{2}, -\frac{1}{2e}\right)$

$\frac{d^2y}{dx^2} = 2(2x + 1)e^{2x} + e^{2x} \cdot 2$

$x = -\frac{1}{2}, \quad \frac{d^2y}{dx^2} > 0 \therefore \text{min.}$  (8)

(b)  $\frac{dy}{dx} = e^0 = 1$  at origin  $\therefore$  tangent is  $y = x$ . (2)

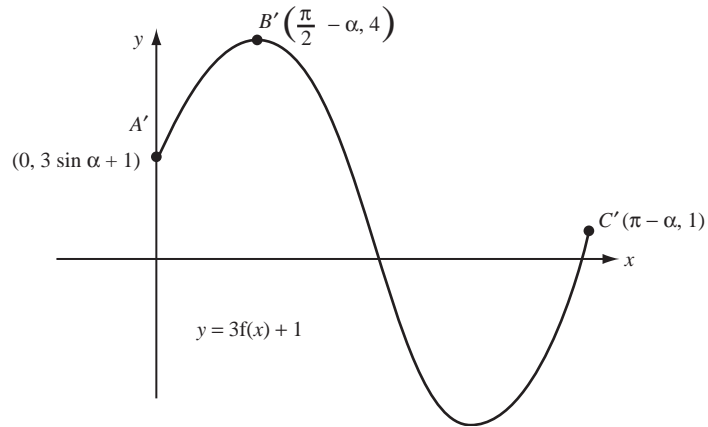
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7. (a)  $A(0, \sin \alpha)$

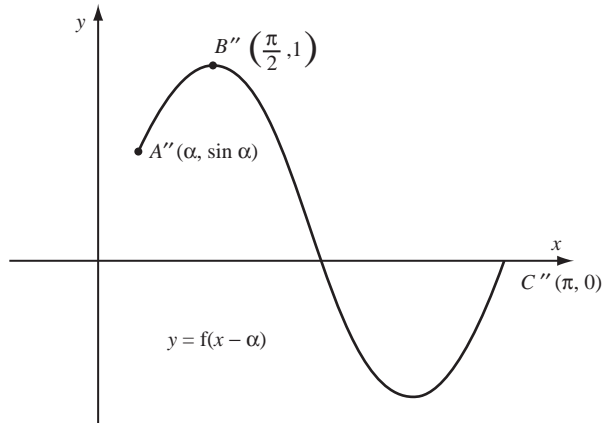
(b)  $B\left(\frac{\pi}{2} - \alpha, 1\right)$

(c)  $(\pi - \alpha, 0)$

(b) (i)

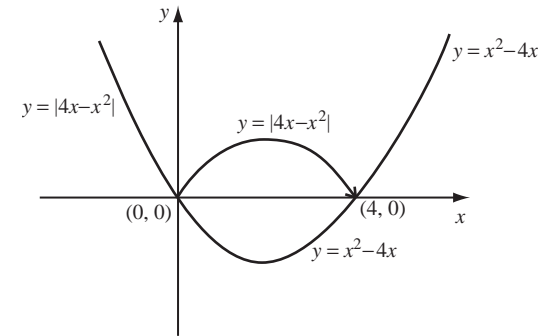


(ii)



(3)

8.



(4)

(a)  $A = 2 \left| \int_0^4 x^2 - 4x \, dx \right|$

$$= 2 \left| \left[ \frac{x^3}{3} - \frac{4x^2}{2} \right]_0^4 \right|$$

$$= 2 \left| \frac{64}{3} - 32 \right|$$

$$= 21 \frac{1}{3} \text{ sq. units}$$

(5)

(b)  $y = x^2 - 4x$

$$\frac{dy}{dx} = 2x - 4$$

$x = 4$ , gradient = 4.

$$y = 4x - x^2,$$

$$\frac{dy}{dx} = 4 - 2x$$

$x = 4$  gradient = -4

$$\angle = 2 \arctan 4 = 151.9^\circ$$

(8)