

## Revision (2)

1.  $5\sin x + 4\cos x = K\sin(x+\alpha)^\circ$

$$= K\sin x \cos \alpha + K\cos x \sin \alpha$$
$$= 5\sin x + 4\cos x$$

$$K\sin \alpha = 5$$

$$K\cos \alpha = 4$$

$$\tan \alpha = \frac{5}{4}$$

$$\alpha = 85.8^\circ$$

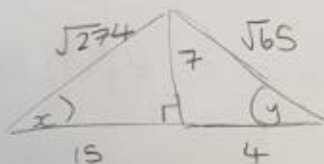
$\frac{\text{O}}{\text{A}} = \frac{\text{O}}{\text{H}}$   
 $\frac{\text{O}}{\text{H}} = \frac{\text{O}}{\text{H}}$

$$K^2 = 5^2 + 4^2$$

$$K = \sqrt{41}$$

$$5\sin x + 4\cos x = \sqrt{41} \sin(x + 85.8^\circ)$$

2.



$$\cos(x+y)$$

$$= \cos x \cos y - \sin x \sin y$$

$$\cos x = \frac{15}{\sqrt{274}} \times \frac{4}{\sqrt{65}} - \frac{7}{\sqrt{274}} \times \frac{7}{\sqrt{65}}$$

$$= \frac{60}{\sqrt{17810}} - \frac{49}{\sqrt{17810}}$$

$$= \frac{11}{\sqrt{17810}}$$

3.  $(3+2\cos x)(3-2\cos x)$

$$= 9 - 4\cos^2 x$$

$$= 9 - 4(1 - \sin^2 x)$$

$$4. \int \left(4x^{\frac{1}{3}} + \frac{1}{x^5}\right) dx = \int (4x^{\frac{1}{3}} + x^{-3}) dx$$

$$= \frac{4x^{\frac{4}{3}}}{\frac{4}{3}} + \frac{x^{-2}}{-2} + C$$

$$= 3x^{\frac{4}{3}} - \frac{1}{2}x^{-2} + C$$

$$= 3x^{\frac{4}{3}} - \frac{1}{2x^2} + C$$

$$5. h'(x) = (x+5)^{-4} dx$$

$$h(x) = \int (x+5)^{-4} dx$$

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

$$= -\frac{1}{3(x+5)^3} + C$$

$$6. \int 4 \cos \theta d\theta$$

$$= -4 \sin \theta + C$$

$$7. \int_{-3}^2 (x^2 - 8x + 16) dx$$

$$= \left[ \frac{x^3}{3} - \frac{8x^2}{2} + 16x \right]_{-3}^2 + C$$

$$= \left( \frac{2^3}{3} - 4(2)^2 + 16(2) \right) - \left( \frac{(-3)^3}{3} - 4(-3)^2 + 16(-3) \right)$$

$$= \left( \frac{8}{3} - 16 + 32 \right) - \left( -\frac{27}{3} - 36 - 48 \right)$$

$$= \left( \frac{8}{3} + 16 \right) - \left( -9 - 36 - 48 \right)$$

$$= \left( \frac{8}{3} + \frac{48}{3} \right) - \left( -93 \right)$$

$$= \frac{56}{3} - \left( -\frac{279}{3} \right)$$

$$= \frac{335}{3} \text{ sq units}$$

$$8. \text{ a) } f(x) = \sqrt{3} \cos x + \sin x \quad K \cos(x - \alpha)$$

$$= K \cos x \cos \alpha + K \sin x \sin \alpha$$

$$= \sqrt{3} \cos x + \sin x$$

$$K \cos \alpha = \sqrt{3}$$

$$K \sin \alpha = 1$$

$$\tan \alpha = \frac{1}{\sqrt{3}}$$

$$\frac{\text{S/A}}{\text{T/C}}$$

$$K^2 = \sqrt{3}^2 + 1^2$$

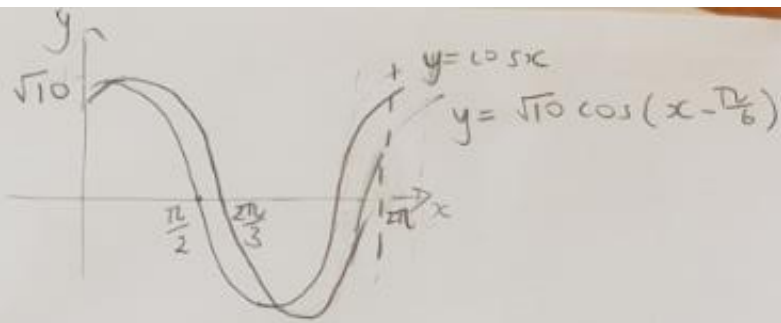
$$= \sqrt{4}$$

$$K = \sqrt{2}$$

$$\alpha = \frac{\pi}{6}$$

$$\sqrt{3} \cos x + \sin x = \sqrt{2} \cos \left( x - \frac{\pi}{6} \right)$$

b)



$$9 a) \sqrt{3} \sin x + \cos x$$

$$K \sin(\alpha x + \alpha)^\circ$$

$$K \sin x \cos \alpha + K \cos x \sin \alpha$$

$$\sqrt{3} \sin x + \cos x$$

$$K \cos \alpha = \sqrt{3}$$

$$K \sin \alpha = 1$$

$$\tan \alpha = \frac{1}{\sqrt{3}}$$

$$= 30^\circ$$

$$\frac{\sqrt{A}}{T} \frac{C}{\sqrt{C}}$$

$$K^2 = \sqrt{3}^2 + 1^2$$

$$= 4$$

$$K = \sqrt{4} = 2$$

$$\sqrt{3} \sin x + \cos x = 2 \sin(x + 30^\circ)$$

max when

$$b) \sqrt{10} \sin(x + 30^\circ) = 1$$

$$x + 30^\circ = 90$$

$$\text{max at } 2, x = 60^\circ$$

$$10. y = \sin 2x + \frac{2}{\sqrt{x}} dx$$

$$= \sin 2x + 2x^{-1/2}$$

$$\frac{dy}{dx} = 2 \cos 2x - x^{-3/2}$$

$$= 2 \cos 2x - \frac{1}{\sqrt{x^3}}$$

11.  $f(x) = \cos^2 x - \sin^2 x$   
 $f'(x) = -2 \sin x \cos x - 2 \sin x \cos x$   
 $= -4 \sin x \cos x$

12.  $f(x) = 5(7-2x)^3$   
 $f'(x) = 15(7-2x)^2 \times -2$   
 $= -30(7-2x)^2$

13.  $f(x) = 2x^{\frac{3}{2}} + \sin^2 x$   
 $f'(x) = 3x^{\frac{1}{2}} + 2 \sin x \cos x$