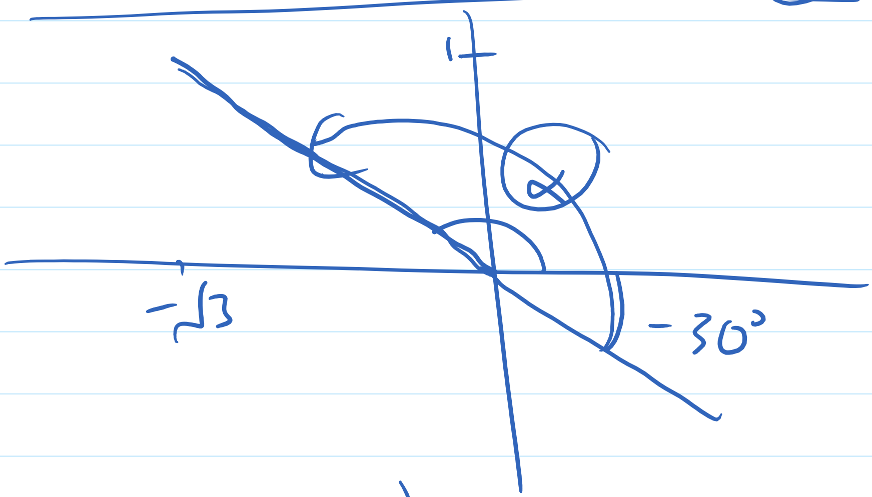
Exam Questions 4 Page 232

Question 3

Soln: $1\sin(x) - \sqrt{3}\cos(x) = R\cos(x - \alpha)$.

$$R = \sqrt{(-\sqrt{3})^2 + 1^2} = \sqrt{4} = 2.$$



$$\tan^{-1}\left(\frac{1}{-\sqrt{3}}\right) = -30°$$

$$\alpha = -30° + 180° = 150°$$

$$\sin(x) - \sqrt{3}\cos(x) = 2\cos(x - 150°)$$

Question 10

$$\frac{1}{\cos(x)\,\mathrm{cosec}^2(x)} = \sec(x) - \cos(x)$$

Consider the LHS:

$$\frac{1}{\cos(x)} \cdot \frac{1}{\mathrm{cosec}\cancel{h}^2(x)} = \frac{1}{\cos(x)} \cdot \frac{1}{1/\sin^2(x)}$$

$$= \frac{\sin^2(x)}{\cos(x)}$$

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

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

$$= \sec(x) - \cos(x).$$

Miscellaneous Exercise 4 on page 232

Qu 5:

$$v = 4\sin\left(\omega t + \frac{\pi}{4}\right) \text{ and } i = \sin(\omega t).$$

Soln.

$$p = vi$$

$$= 4\sin\left(\omega t + \frac{\pi}{4}\right) \cdot \sin(\omega t)$$

(4.37) $\sin(A+B) = \sin A\cos(B) + \cos(A)\sin(B)$

$$= 4\left[\sin(\omega t)\underbrace{\cos\left(\frac{\pi}{4}\right)}_{=\frac{1}{\sqrt{2}}} + \cos(\omega t)\underbrace{\sin\left(\frac{\pi}{4}\right)}_{=\frac{1}{\sqrt{2}}}\right]\sin(\omega t)$$

$$= \frac{4}{\sqrt{2}}\left[\sin(\omega t) + \cos(\omega t)\right] \cdot \sin(\omega t)$$

$$= \frac{4}{\sqrt{2}}\left[\sin^2(\omega t) + \cos(\omega t)\sin(\omega t)\right]$$

$$2\sin(A)\cos(A) = \sin(2A).$$

$$\sin(A)\cos(A) = \frac{1}{2}\sin(2A)$$

$$= \frac{4}{\sqrt{2}}\left[\sin^2(\omega t) + \frac{1}{2}\sin(2\omega t)\right]$$

$$= \frac{\cancel{4}\,2}{\sqrt{2}\cdot\cancel{2}}\left[2\sin^2(\omega t) + \sin(2\omega t)\right]$$

$2^{1-1/2} = 2^{1/2} = \sqrt{2}$

$$= \sqrt{2}\left[2\sin^2(\omega t) + \sin(2\omega t)\right]$$

$$=$$