Core Mathematics C34(GCE)

Practice Answer 3

Standard A*

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Critical thinking is the key to solve real world problems.

Children must be taught how to think, not what to think.

A great teacher will be creating students to do new things through critical thinking, Not simply repeating what other generations have done before. We do not need another Albert Einstein or Isaac Newton.... we need a person better than them.

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Answer:

Method 1

$$\cos(70° + x)$$

$$= \cos(30° + (40° + x))$$

$$= \cos 30° \cos(40° + x) - \sin 30° \sin(40° + x)$$

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

$$= \frac{\sqrt{3(1 - b^2)} - b}{2}$$

Note: $\sin^2(40 + x)° + \cos^2(40 + x)° = 1$

but given that, $\sin(40° + x) = b$,

$b^2 + \cos^2(40 + x)° = 1$

$\cos(40° + x) = \sqrt{1 - b^2}$

Answer:

Method 2

Given that, $\sin(40° + x) = b \Rightarrow (40° + x) = \sin^{-1}(b)$

$\cos(70° + x) = \cos(30° + \sin^{-1}(b))$

$= \cos 30° \cos(\sin^{-1}(b)) - \sin 30° \sin(\sin^{-1}(b))$

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

$= \frac{\sqrt{3(1 - b^2)} - b}{2}$

Let $\sin^{-1}(b) = \alpha \Rightarrow \sin\alpha = b$

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

$b^2 + \cos^2\alpha = 1 \Rightarrow \cos\alpha = \sqrt{1 - b^2} \Rightarrow \cos(\sin^{-1}(b)) = \sqrt{1 - b^2}$

Golden Rules

- $\sin(A+B) = \sin A \cos B + \cos A \sin B \Rightarrow \sin(A+A) = \sin A \cos A + \cos A \sin A \Rightarrow \sin(2A) = 2\sin A \cos A$
- $\sin(A-B) = \sin A \cos B - \cos A \sin B$
- $\cos(A+B) = \cos A \cos B - \sin A \sin B \Rightarrow \cos(A+A) = \cos A \cos A - \sin A \sin A \Rightarrow \cos 2A = \cos^2 A - \sin^2 A$

  $\cos 2A = 2\cos^2 A - 1$

  $\cos 2A = 1 - 2\sin^2 A$
- $\cos(A-B) = \cos A \cos B + \sin A \sin B$
- $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B} \Rightarrow \tan(A+A) = \frac{\tan A + \tan A}{1 - \tan A \tan A} \Rightarrow \tan(2A) = \frac{2\tan A}{1 - \tan^2 A}$
- $\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$

Traditonal or Online classes

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