1.)

Solve for x in the question: Arc tan 2x + Arc tan x = (p / 2) - 45°

Solutions

Let: A = Arc tan 2x
tan A = 2x

B = Arc tan x
tan B = x

Arc tan 2x + Arc tan x = (p / 2) - 45°

A + B = 90° - 45°

A + B = 45°

Take tangent on both sides:

tan (A + B) = tan 45°

$$\frac{\tan A + \tan B}{1 - \tan A \tan B} = 1$$

tan A + tan B = 1 – tan A tan B
2x + x = 1 – 2x (x)
3x = 1 – 2x²
2x² + 3x – 1 = 0

Using the formula:

$$x = \frac{3 \pm \sqrt{(3)^2 - 4(2)(-1)}}{2(2)} = \frac{-3 \pm 4.123}{4}$$

$$x = \frac{-3 + 4.123}{4} - 0.281$$

$$x = \frac{-3 - 4.123}{4} - -1.781$$

2.)

If 84° - 0.4 x = Arc tan (cot 0.25x) , find x.

Solutions

84° – 0.4 x = Arc tan (cot 0.25x)

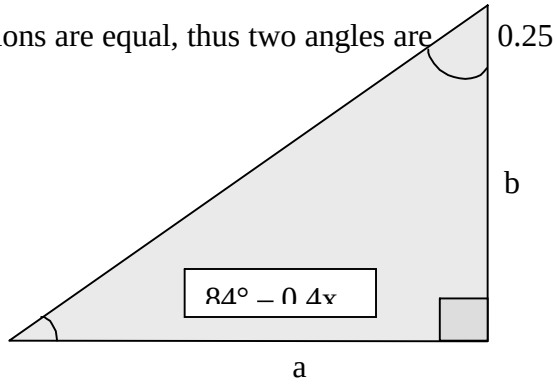
tan (84° – 0.4x) = cot 0.25x

Since the tangent and the cotangent functions are equal, thus two angles are complimentary.

(84° – 0.4 x) + 0.25 x = 90°

0.15 x = 6°

x = 40°



3.)

Evaluate $\cos\left[\arctan\frac{15}{8} - \arctan\frac{7}{24}\right]$

Solutions

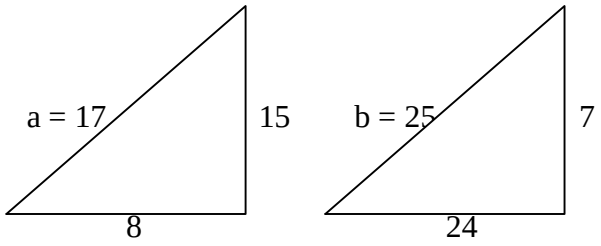
Let:

$A = \arctan 15/8$

$\tan A = 15/8$

$B = \arctan 7/25$

$\tan B = 7/27$



Using Pythagorean theorem:

$a = \sqrt{8^2 + 15^2} = 17$

$b = \sqrt{24^2 + 7^2} = 25$

$$\cos\left[\arctan\frac{15}{8} - \arctan\frac{7}{24}\right] = \cos(A - B)$$

$$= \cos A \cos B + \sin \sin B$$

Refer to the figure, substitute values:

$$\cos A \cos B + \sin A \sin B = \left(\frac{8}{17}\right)\left(\frac{24}{25}\right) + \left(\frac{15}{17}\right)\left(\frac{7}{25}\right)$$

$$= \frac{297}{425}$$

4.)

A merchant has three items on sale namely: a radio for $50,00. a clock for $30,00, and a flashlight $1,00. At the end of the day, she has sold a total of 100 of the three sale items and has taken exactly $1,000.00 on the total sales. How radios did she sell?

Solutions

Let: x = number of radios sold
y = number of clock sold
z = number of flashlight sold

$x + y + z = 100$

$z = 100 - x - y \rightarrow$ Equation 1

$50x + 30y + z = 1000 \rightarrow$ Equation 2

Substitute Eq. 1in Eq. 2:

$50x + 30y + 100 - x - y = 1000$

$49x + 29y = 900 \rightarrow$ Equation 3

Notes

The equation is a Diophantine equation. The value of x and y must be whole numbers. Try to substitute values of x from choices in Eq. 3 to solve for y (whole number)

when x = 16:

$49x + 29y = 900$

$$y = \frac{900 - 49x}{29}$$

$$= \frac{900 - 49\,(16)}{29}$$

$y = 4 \rightarrow$ whole number

Thus, the number of radios to be sold must be 16.