

24th January



How many points of intersection does the circle $x^2 + y^2 = 8$ have with the line $x + y = 4$? $y = 4 - x$

$$x^2 + (4-x)^2 = 8$$

$$x^2 + 16 - 8x + x^2 = 8$$

$$2x^2 - 8x + 8 = 0$$

$$x^2 - 4x + 4 = 0$$

$$(x-2)(x-2) = 0$$

$$x = 2$$

\therefore only 1 point of intersection

Work out the rate of change of y with respect to x at the point on the curve

$$y = x^2(x-4) \text{ where } x = 3$$

$$y = x^3 - 4x^2$$

$$\frac{dy}{dx} = 3x^2 - 8x$$

when $x = 3$

$$\frac{dy}{dx} = 3 \times 3^2 - 8 \times 3$$

$$= 3$$

Solve the simultaneous equations

$$10x + 60y + 10z = 25 \quad \text{--- (1)}$$

$$5x + 40y + 20z = 40 \quad \text{--- (2)}$$

$$20x + 20y + 40z = 30 \quad \text{--- (3)}$$

$$\text{(1)} \times 2$$

$$20x + 120y + 20z = 50 \quad \text{--- (4)}$$

$$\text{(2)} \times 4$$

$$20x + 160y + 80z = 160 \quad \text{--- (5)}$$

$$\text{(5)} - \text{(4)} \Rightarrow 40y + 60z = 110 \quad \text{--- (6)}$$

$$\text{(4)} - \text{(3)} \quad 100y - 20z = 20 \quad \text{--- (7)}$$

$$300y - 60z = 60 = 3 \times \text{(7)}$$

$$3 \times \text{(7)} - \text{(6)} \Rightarrow 340y = 170$$

$$\boxed{y = 0.5}$$

sub $y = 0.5$ into (6)

$$20 + 60z = 110$$

$$60z = 90$$

$$\boxed{z = 1.5}$$

sub $z = 1.5$ & $y = 0.5$ into (1)

$$10x + 30 + 15 = 25$$

$$10x = -20$$

$$\boxed{x = -2}$$

How many solutions of $\tan x = k$, where $k < 0$, are between 90° and 360° ?

2

