**Answer on Question #34550 – Math – Differential Equations**

Find the solution of the equation that satisfies the given conditions for x-> infinity. The equation is (x^2)(y') - cos(2y) = 1, y(+infinity) = (9)(pie)/(4)

**Solution**

$$x^2y' - cos(2y) = 1 \rightarrow \frac{dy}{1 + cos(2y)} = \frac{dx}{x^2} \rightarrow$$

$$\rightarrow \int \frac{dy}{1+cos(2y)} = \int \frac{dx}{x^2} \rightarrow \frac{tan(y)}{2} = -\frac{1}{x} + c \rightarrow$$

$$\rightarrow tan(y) = -\frac{2}{x} + 2c$$

$$\rightarrow \quad y = tan^{-1}\left(\frac{2cx - 2}{x}\right)$$

If $y(\infty) = tan^{-1}(2c) = \frac{9\pi}{4}$, then

$$tan\big(y(\infty)\big) = tan\left(tan^{-1}(2c)\right) = 2c = tan\left(\frac{9\pi}{4}\right) = 1$$

$$\rightarrow \ 2c = 1 \ \rightarrow \ c = \frac{1}{2}$$

Thus, $y = tan^{-1}\left(\frac{x-2}{x}\right)$.