

11) Determine by inspection at least one solution of the given differential equation

Sol: The given differential equation is

$$xy' + y = 3x^2$$

The right hand side of above equation has only one term of type x^2 .

Consequently, xy' and y must be of type x^2 . A natural choice for y is $y = ax^2$. Now, consider xy' . It has already one x , all we need that y' be in the form of bx .

The derivative of our chosen y is indeed in this form, i.e. $y' = 2ax$

So,

$$\begin{aligned}xy' + y &= x(2ax) + ax^2 \\ &= 2ax^2 + ax^2 \\ &= 3ax^2\end{aligned}$$

The $a = 1$, would make $xy' + y = 3x^2$.

Thus, $y = x^2$ is one solution of the given differential equation.

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MATH 2280