Section 31.4: Linear DEs of the First Order

Suppose you are able to rewrite a DE into the form

$$\frac{dy}{dx} + \underline{\underline{P(x)}} \, y = \underline{\underline{Q(x)}}$$

functions of x <u>only</u>

this DE is called "linear of first order"

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example: Are the following DEs linear, first order? If so, give $P(x)$ and $Q(x)$.

a) $y' + \dfrac{y}{x} = x^3$ yes, $P(x) = \dfrac{1}{x}$, $Q(x) = x^3$

b) $\dfrac{dy}{dx} + y^2 = e^x$ no

c) $x\,dy - 2x^3 y\,dx = 3x\,dx$ divide by $x\,dx$

$\dfrac{dy}{dx} - 2x^2 y = 3$ yes, $P(x) = -2x^2$
$Q(x) = 3$