In 5:

$$\frac{dy}{dx} - \underbrace{\frac{3}{x\ln x}}_{P}\, y = \underbrace{2x\ln^3 x}_{Q}. \qquad y(\underbrace{e}_{x_0}) = e + e^2$$

Using the theorem, we need to find intervals where P and Q are continuous and which contain $x_0 = e$.

P: Not continuous <=> not defined and not defined

<=> (a) divide by zero: $x=0$ or $\ln(x)=0 \Rightarrow x=1$

or

(b) ln undefined: $x \leq 0$.

So, p continuous when (a) & (b) don't happen:

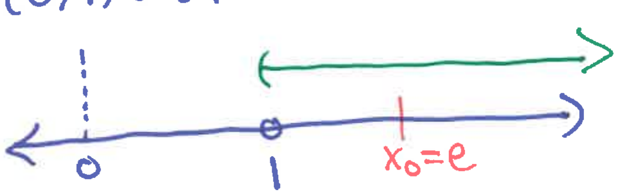
$x \neq 0$ and $x \neq 1$ and $x > 0$

$\Rightarrow$ $\boxed{x \text{ in } (0,1)\cup(1,\infty)}$ (*)

Q: Not defined <=> ln x not defined <=> $x \leq 0$, and is continuous whenever defined:

$\boxed{x \text{ in } (0,\infty)}$ (**)

So: Taking the intersection of (*) and (**) gives $(0,1)\cup(1,\infty)$ and on a #-line, we see:



Interval of validity is $(1,\infty)$ — Ans