

2019 PI Q3

$$\begin{aligned} \text{a)} \quad & 3xy - 9x + 4y - 12 \\ & 3x(y-3) + 4(y-3) \\ & (3x+4)(y-3) \end{aligned}$$

$$\text{b)} \quad g(x) = 3x \ln x - 9x + 4 \ln x - 12$$

$$\text{let } \ln x = y \quad (3x+4)(\ln x - 3) = 0$$

$$x = -\frac{4}{3}$$

$$\begin{aligned} \ln x &= 3 \\ x &= e^3 \end{aligned}$$

$$\text{c)} \quad g'(x) = \overbrace{3x \left(\frac{1}{x}\right) + \ln x (3)}^{\text{Product Rule}} - 9 + \frac{4}{x}$$

$$g'(e) = 3 + 3 \ln e - 9 + \frac{4}{e}$$

$$= 3 + 3 - 9 + \frac{4}{e}$$

$$= \frac{4}{e} - 3$$

$$= -1.53$$