

$$\underline{\underline{\text{So)}}} \int_{-\infty}^{\infty} f(x) dx = 1$$

$$\int_{-\infty}^{\infty} k e^{-5x} dx = 1$$

$$k \int_0^{\infty} e^{-5x} dx = 1 \Rightarrow \frac{-k}{5} \left[e^{-5x} \right]_0^{\infty} = 1$$

$$\Rightarrow \frac{-k}{5} \left[e^{-\infty} - e^0 \right] = 1$$

$$\Rightarrow \frac{k}{5} = 1 \Rightarrow \boxed{k=5}$$

$$\text{So } f(x) = \begin{cases} 5 e^{-5x} & ; x > 0 \\ 0 & ; \text{o.w} \end{cases}$$

$$2) P(X > 0)$$

$$\begin{aligned} \int_0^{\infty} 5 e^{-5x} dx &= \left[-e^{-5x} \right]_0^{\infty} \\ &= \left[-e^{-\infty} + e^0 \right] = 1 \end{aligned}$$

$$3) P\left(\frac{1}{3} < x < \frac{7}{2}\right) = \int_{\frac{1}{3}}^{\frac{7}{2}} 5 e^{-5x} dx = \left[-e^{-5x} \right]_{\frac{1}{3}}^{\frac{7}{2}}$$

$$= -e^{-5 \cdot \frac{7}{2}} + e^{-\frac{5}{3}}$$

$$= -e^{-\frac{35}{2}} + e^{-5/3}$$