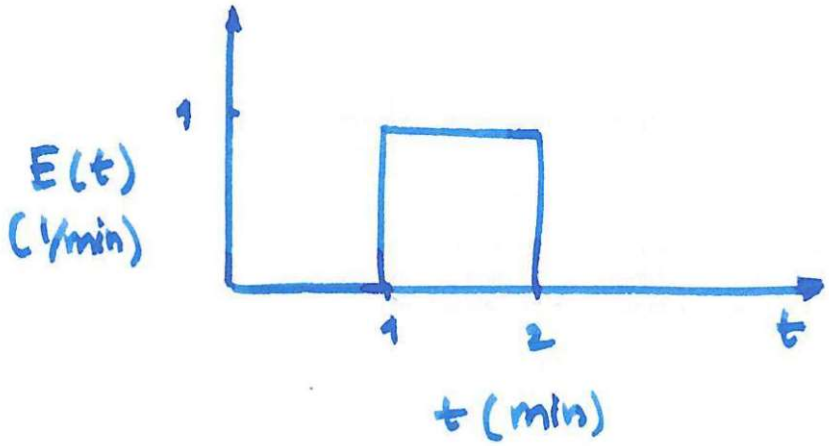
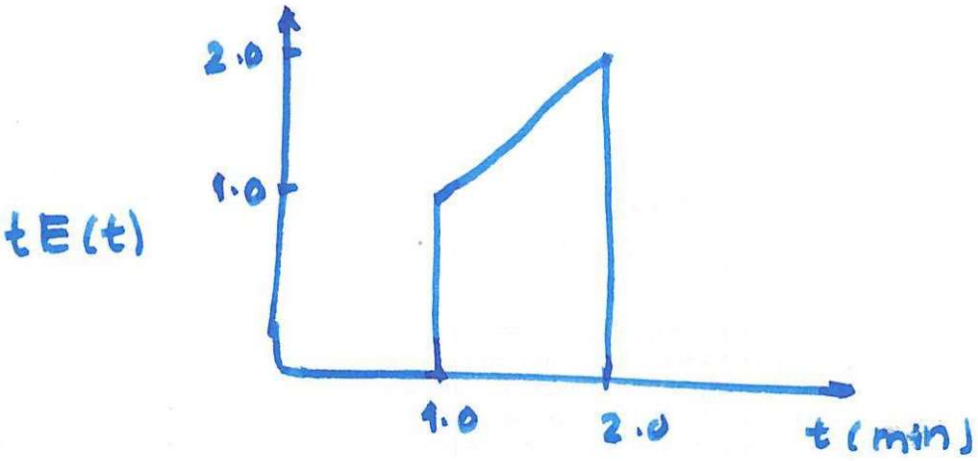
P 16-6

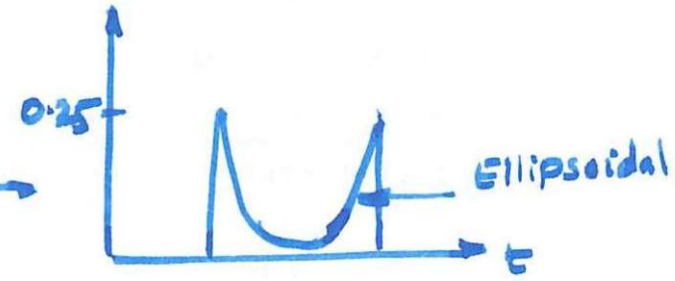
a)





$$t_m = \int_0^\infty t\,E(t)\,dt = 1 + \frac{1}{2}\cdot 1 \times 1 = 1.5 \text{ min}$$

$$\sigma^2 = \int_0^\infty (t - t_m)^2 E(t)\,dt$$



$$= 1 \times 0.25 - \frac{1}{2} \times \pi \times 0.25 \times 0.5$$

$$\sigma = \sqrt{0.053} = 0.23$$

b) Fraction of fluid that spends a time 1.5 min or longer

$$= \int_{1.5}^{\infty} E(t)\,dt$$

$$= 0.5$$

c) Fraction of fluid that spends 2 min or less in the reactor

$$= \int_{0}^{2} E(t)\,dt$$

$$= 1.0$$

d) Fraction of fluid that spends between 1.5 min and 2 min

$$= \int_{1.5}^{2} E(t)\,dt$$

$$= 0.5.$$