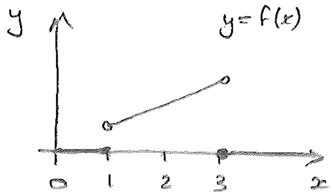
p140 Ex 7B no. 1

1. $f(x) = \begin{cases} \frac{1}{4}x & 1 < x < 3 \\ 0 & \text{otherwise.} \end{cases}$

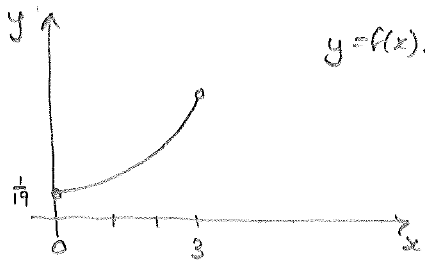


$$\begin{aligned} P(\text{resistance} < 2) &= \int_1^2 f(x)\,dx \\ &= \int_1^2 \tfrac{1}{4}x\,.dx \\ &= \left[\tfrac{1}{8}x^2\right]_1^2 \\ &= \tfrac{1}{8}(2^2 - 1^2) \\ &= \tfrac{1}{8}(4-1) \\ &= \underline{\underline{\tfrac{3}{8}}}. \end{aligned}$$

Ex 7B no. 2.

X = surface area (cm^2) occupied 8 hrs later

$f(x) = \frac{1}{19}e^x \quad 0 < x < 3.$



Valid pdf if $\int_0^3 f(x)\,dx = 1$

$$\text{so } \int_0^3 f(x)\,dx = \int_0^3 \frac{1}{19}e^x . dx$$
$$= \frac{1}{19}\int_0^3 e^x . dx$$
$$= \frac{1}{19}\left[e^x\right]_0^3$$
$$= \frac{1}{19}\left(e^3 - e^0\right)$$
$$= \frac{1}{19}\left(20.0855 - 1\right)$$
$$= \frac{1}{19} \times 19.0855$$
$$\approx 1$$

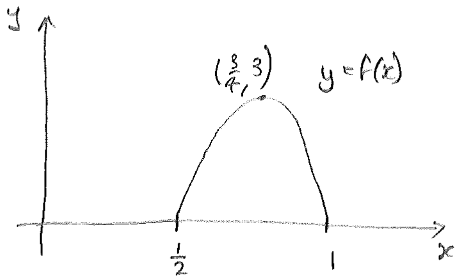
So, for the purposes of modelling, this is a plausable pdf.

$$P(X > 2) = \int_2^3 \frac{1}{19}e^x\,dx$$
$$= \frac{1}{19}\left[e^x\right]_2^3$$
$$= \frac{1}{19}\left(e^3 - e^2\right)$$
$$= 0.668238\ldots$$
$$\approx 0.6682 \text{ (4dp)}$$

Ex 7B no. 3

X = weekly demand for petrol (thousands of litres)

$f(x) = 48(x - \frac{1}{2})(1-x) \qquad \frac{1}{2} < x < 1$



(a quadratic with roots at $\frac{1}{2}$ and 1, with a maximum)

940 litres = 0.94 thousand litres.

Garage runs out of petrol if demand is > 0.94

$\therefore$ P(garage runs out of petrol) = $P(X > 0.94)$

$= \int_{0.94}^{1} f(x)\,dx$

$= \int_{0.94}^{1} 48(x - \frac{1}{2})(1-x)\,dx$

$= 0.039744\ldots$ by TI-Nspire

≈ 0.040 (3dp).