Part 1: Evaluate

(a) $7! = 7 \cdot 6 \cdot 5 \ldots \cdot 1 = \boxed{5040}$

(b) $\sum_{x=1}^{20} x = 1 + 2 + 3 + \ldots + 20 = \boxed{210}$

(c) $\sum_{i=1}^{20} w = \boxed{20w}$

(d) $\sum_{x=1}^{3} \left[cx^3 + 1\right] = (c+1) + (c8+1) + (c27+1) = \boxed{36c + 3}$

(e) Expand $(x+4)^2 \rightarrow \boxed{(x^2 + 8x + 16)}$

(f) Expand $(x-4)^2 \rightarrow \boxed{(x^2 - 8x + 16)}$

(g) If $f(x) = \begin{cases} \frac{1}{8} & : x = 0, 3 \\ \frac{3}{8} & : x = 1, 2 \\ 0 & : \text{otherwise} \end{cases}$, then compute the following:

(i) $\sum_{\forall x} [xf(x)] = 3 \cdot \frac{1}{8} + 2 \cdot \frac{3}{8} + \frac{3}{8} = \frac{12}{8} = \boxed{\frac{3}{2}}$

(ii) $\sum_{\forall x} \left[(x-1.5)^2 f(x)\right] = (-1.5)^2 \frac{1}{8} + (-0.5)^2 \frac{3}{8} + (0.5)^2 \frac{3}{8} + (1.5)^2 \frac{1}{8} = \boxed{\frac{3}{4}}$

(h) $\int_0^1 x\, dx = \left.\frac{x^2}{2}\right|_0^1 = \frac{1}{2} - 0 = \boxed{\frac{1}{2}}$

(i) $\int_1^3 x^2\, dx = \left.\frac{x^3}{3}\right|_1^3 = 9 - \frac{1}{3} = \boxed{\frac{26}{3}}$

(j) $\int_0^1 (x^3 + 1) dx = \left.\frac{x^4}{4}\right|_0^1 + \left.x\right|_0^1 = \frac{1}{4} + 1 = \boxed{\frac{5}{4}}$

(k) $\int_0^\infty \left[ke^{-\frac{x}{3}}\right] dx = k \int_0^\infty e^{-\frac{x}{3}} dx = -3ke^{-\frac{x}{3}} \Big|_0^\infty = 0 - (-3k) = \boxed{3k}$

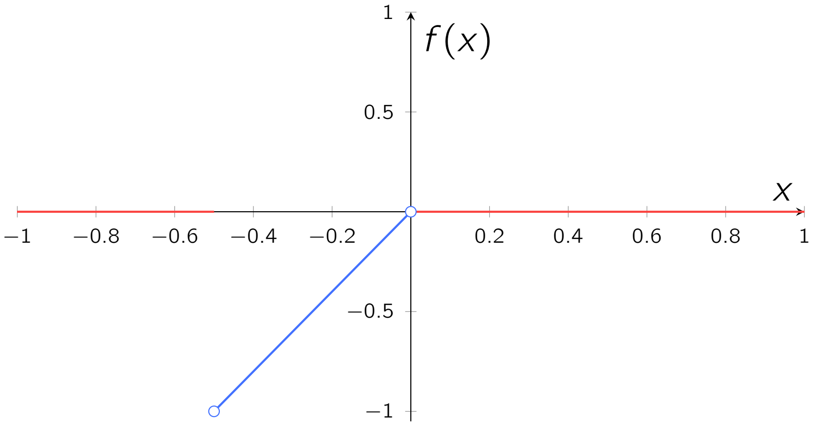
(l) If $f(x) = \begin{cases} \frac{x^2}{3} & : -1 < x < 2 \\ 0 & : \text{ otherwise} \end{cases}$, then compute the following:

(i) $\int_{-\infty}^\infty [xf(x)]\, dx = \int_{-1}^2 \frac{x^3}{3} dx = \frac{1}{3} \int_{-1}^2 x^3 dx = \frac{1}{3} \cdot \frac{x^4}{4} \Big|_{-1}^2 = \frac{1}{3} \cdot \frac{15}{4} = \boxed{\frac{5}{4}}$

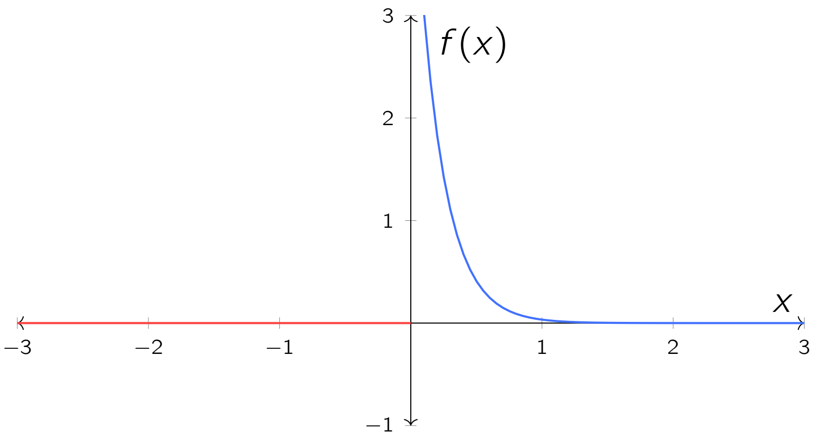
(ii) $\int_{-\infty}^\infty \left[x^2 f(x)\right] dx = \int_{-1}^2 \frac{x^4}{3} dx = \frac{1}{3} \int_{-1}^2 x^4 dx = \frac{1}{3} \cdot \frac{x^5}{5} \Big|_{-1}^2 = \frac{1}{3} \cdot \frac{33}{5} = \boxed{\frac{11}{5}}$

Part 2: Sketch

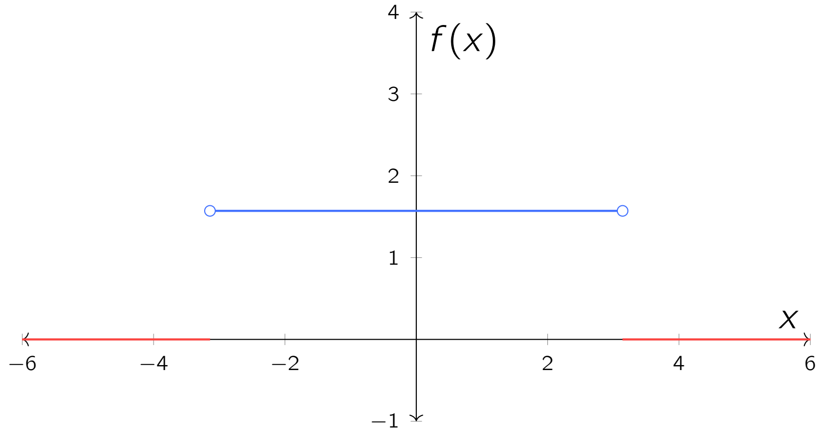
(a) $f(x) = \begin{cases} 2x & : -0.5 < x < 0 \\ 0 & : \text{ otherwise} \end{cases}$



(b) $f(x) = \begin{cases} 5e^{-5x} & : x > 0 \\ 0 & : \text{ otherwise} \end{cases}$



(c) $f(x) = \begin{cases} \frac{1}{2\pi} & : -\pi < x < \pi \\ 0 & : \text{ otherwise} \end{cases}$



(d) $f(x) = \begin{cases} 0 & : x < 0 \\ \frac{x^2}{4} & : 0 \leq x < 1 \\ \frac{x+1}{4} & : 1 \leq x < 2 \\ 1 & : x \geq 2 \end{cases}$