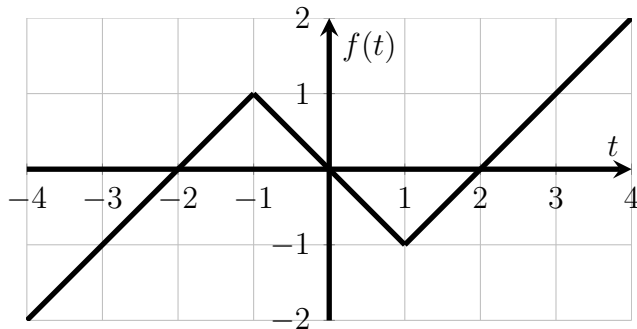


1. Below is the graph of $f(t)$, $t \in \mathbb{R}$. Let $F(x) = \int_0^x f(t) dt$.



(a) Without finding F explicitly, answer the following:

- i. What is $F(3)$? $F'(3)$? $F''(3)$?
- ii. What is $F(-3)$? $F'(-3)$? $F''(-3)$?
- iii. For what values of x is $F(x) = 0$?
- iv. On what intervals is F increasing/decreasing?
- v. Find and classify all local extrema of F .
- vi. On what intervals is F concave up/down?
- vii. Find any inflection points of F .

(b) Find an explicit formula for $f(t)$.

(c) Find an explicit formula for $F(x)$ and sketch a graph of F . [You may want to use the “recovery” interpretation of the fundamental theorem of calculus: if g' is continuous on an interval containing a and x then $g(x) = g(a) + \int_a^x g'(t) dt$.]

2. Compute the following indefinite and definite integrals.

(a) $\int (3^x + x^3)dx$, $\int_0^1 (3^x + x^3)dx$

(b) $\int \frac{x}{x+1}dx$, $\int_0^1 \frac{x}{x+1}dx$

(c) $\int 2xe^{x^2} dx$, $\int_{-1}^1 2xe^{x^2} dx$

3. Find $F(x) = \int_0^x e^{-t}dt$ and $A = \lim_{x \rightarrow \infty} F(x)$. What area does A represent (draw a picture)?

4. What is wrong with the following computation?

$$\int_{-1}^3 \frac{dx}{x^2} = -\frac{1}{x} \Big|_{-1}^3 = -\frac{1}{3} - \left(-\frac{1}{-1}\right) = -\frac{4}{3}$$