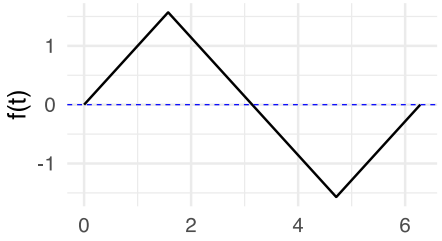
MOSAIC Calculus Quiz 7: Prof. Kaplan

May 2, 2025

Student name: _____. Do what you can in 30 minutes.

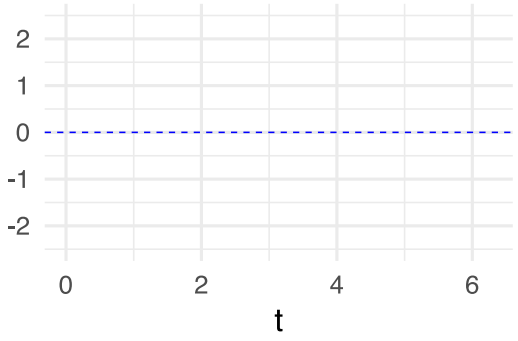
Question 7.1 Consider this function



a. Which one of the pattern-book functions most closely resembles the $f(t)$ plotted above?

b. Give a formula for the anti-derivative of the function you chose to answer (a).

c. On the axis grid below, draw in both the function in (b) **AND** your best sketch of the anti-derivative of $f(t)$. (That is, sketch the anti-derivative of the sharp-elbowed function drawn in the previous plot as well as your function in (b).)



d. Explain what the "constant of integration" has to do with the alignment of the two functions you sketched in (c).

Question 7.2

Here are some definite integrals for which, without stating anything more about the function, we give you the numerical result.

$\int_2^5 f(x)\,dx = 8$ $\int_{-5}^{-2} g(x)\,dx = 3$

$\int_2^{10} f(x)\,dx = -6$ $\int_{-5}^{5} g(x)\,dx = 1$

Using these the facts, calculate the following integrals. If there's not sufficient information given to perform the calculation, say so.

(a) $\int_5^{10} f(x)\,dx$

(b) $\int_{-2}^{2} f(x)\,dx$

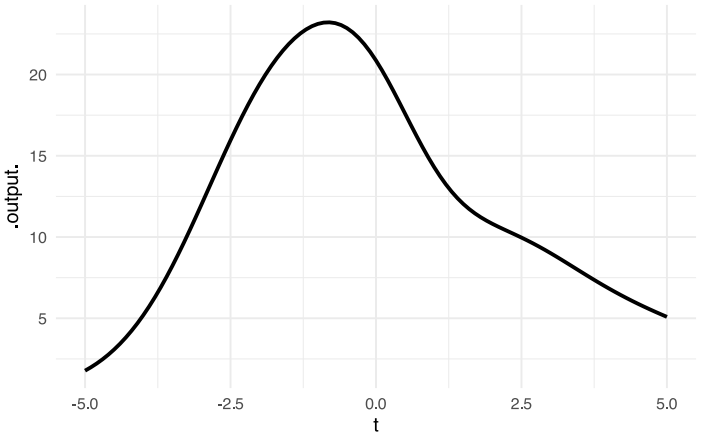
(c) $\int_{-5}^{10} 3f(x)\,dx$

(d) $\int_{-5}^{5} |f(x)|\,dx$

(e) $\int_{-5}^{10} [3f(x) - 2x]\,dx$

(f) $\int_{-2}^{5} f(x)\,dt$

Question 7.3 Consider the function graphed below and answer as best you can.



Is this function the derivative or the anti-derivative of functions?

Question 7.4 Explain the distinctions between an "anti-derivative," a "definite," and an "indefinite" integral.

Question 7.5 Simplify these expressions as much as possible:

1. $$\int \frac{1}{t} dt$$

2. $$\int \frac{1}{t^2} dt$$

3. $$\int \cos(\omega t) dt$$

4. For this one, keep in mind that $\int_{-\infty}^{\infty} \text{dnorm}\ (t) dt = 1$.

$$\int_0^{\infty} \text{dnorm}\ (t) dt$$

.

5. $$\int_0^{\infty} \text{pnorm}\ (t) dt$$

Question 7.6 A statement like this appears in the textbook. The one in the textbook is correct, but this one has a couple of typographical errors. Fix them.

$$\int_a^b f(t) dx = F(t)\ |_a^b = F(a) - F(b)$$