

1. Express the definite integral as the limit of a Riemann sum. Explicitly define **all**

expressions you use. $\int_{-2}^1 \frac{x}{x+3} dx$

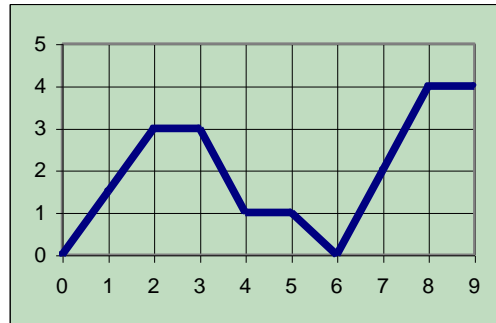
2. Approximate the definite integral $\int_1^3 \frac{x-1}{x} dx$ as a sum. Use four equal subintervals and right endpoints.

3. Find the derivative $\frac{dy}{dx}$ if $y = \int_{\sin(x)}^5 \frac{1}{u^3} du$. Be sure to show your work and give the statement of any theorems that you use.

4. Given the graph of $y = f(x)$:

a) Find $\int_3^8 f(x) dx$.

b) Find the average value of f on $[3, 8]$.



5. Find the antiderivatives for the following functions:

a) $f(x) = \frac{x^2 + 2x - 1}{x^2}$

b) $g(\theta) = \sec \theta \tan \theta + \sin \theta$

c) $g(x) = \frac{1}{1 + 9x^2}$

6. Use the Fundamental Theorem of Calculus to evaluate the following definite integrals.

a) $\int_1^4 \frac{1 + \sqrt{x}}{\sqrt{x}} dx$

b) $\int_1^e \frac{3}{x} dx$

c) $\int_{\pi/6}^{\pi/2} \sin x dx$

7. Let $N(t)$ be the number of fish in a lake at the end of t months after stocking. Find the net change in the number of fish from the end of the first month to the end of the sixth

month. If $\frac{dN}{dt} = 2e^{-5t}$. Also, find $N(t)$ if $N(0) = 100$.

8. Find the total area bounded by $y = 4x$ and $y = x^3$.

9. Find the length of the given by $2y^2 = 3x^3$ from $x = 0$ to $x = 1$.