

Name: _____ / 40

There are 40 points possible on this quiz. No aids (book, calculator, etc.) are permitted. Show all work for full credit.

1. [10 points] In each case below, find a function f that satisfies the given criteria.

a. $f'(t) = \cos(t) - 1/t^3$

b. $f''(t) = 6 - 2e^t, f(0) = 1, f'(0) = -3$

2. [10 points] Gravel is being added to a pile at a rate of rate of $1 + t^3$ tons per minute for $0 \leq t \leq 10$ minutes. That is, if $G(t)$ is the amount of gravel (in tons) in the pile at time t , then

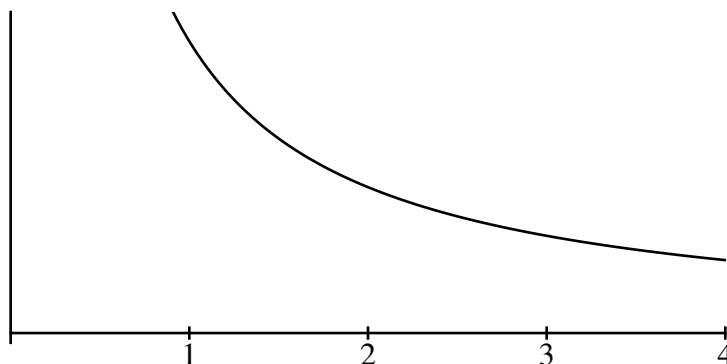
$$G'(t) = 1 + t^3.$$

At time $t = 0$ the pile contains 3 tons of gravel.

a. Find an expression for $G(t)$.

b. How much gravel is in the pile at time $t = 10$ minutes?

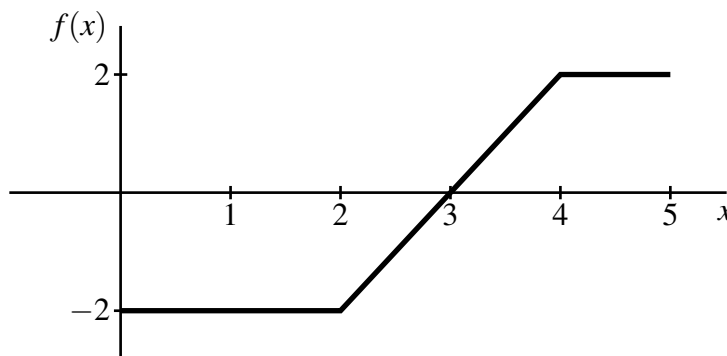
3. [10 points] Consider the graph of $f(x) = 3/x$ below.



- a. Estimate the area under the graph between $x = 1$ and $x = 3$ using four rectangles and right-hand endpoints. Express your answer as a single fraction.

- b. In the diagram above, add rectangles to show the area that you actually computed.
- c. Is your estimate an overestimate or an underestimate? Briefly justify your answer.

4. [10 points] The graph of the function $f(x)$ is shown below.



Evaluate the following integrals using the area interpretation of the integral.

a. $\int_0^3 f(x) dx$

b. $\int_2^4 f(x) dx$

c. $\int_0^5 f(x) dx$