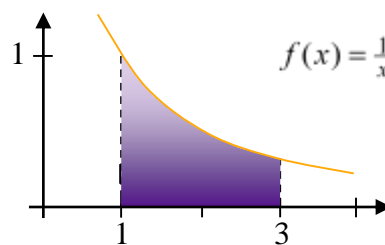




Examples 5.6 – Definite Integrals of Exponentials and Logarithms

1. (a) Use a midpoint approximation and $n = 8$ subintervals to approximate the net area bounded by the graph of $f(x) = \frac{1}{x}$ and the x -axis on $[1, 3]$.



- (b) Use the FTC to find the exact value of $\int_1^3 \frac{1}{x} dx$.

Solution:

(a) STEP 1:

STEP 2:

STEP 3:

STEP 4:

(b)

Additional note: The table below shows left-hand, midpoint, and right-hand approximations of $\int_1^3 \frac{1}{x} dx$ for $n = 4, 8, 100,$ and 1000 subintervals. Note that in this example the midpoint approximation requires “only” 100 rectangles for four decimal place accuracy.

n	Left-hand	Midpoint	Right-hand	Exact
4	1.283333	1.089755	0.950000	1.098612...
8	1.186544	1.096325	1.019877	
100	1.105309	1.098597	1.091975	
1000	1.099279	1.098612	1.097945	

2. An object in rectilinear motion has velocity given by $v(t) = e^t$ cm/min. Find the displacement and the total distance traveled during the first four minutes.

Solution: