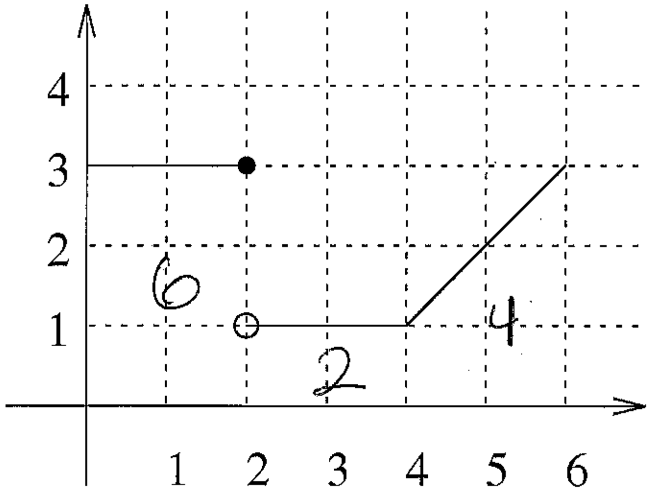
Math 150 Quiz 8 Fall 2011

Name: Key

NON-GRAPHING CALCULATORS ALLOWED

1. [10 points] Below is the graph of the velocity $v(t)$ verses time t of an object in feet per second moving a straight line. Graph the position $s(t)$ verses time t assuming $s(0) = 0$.

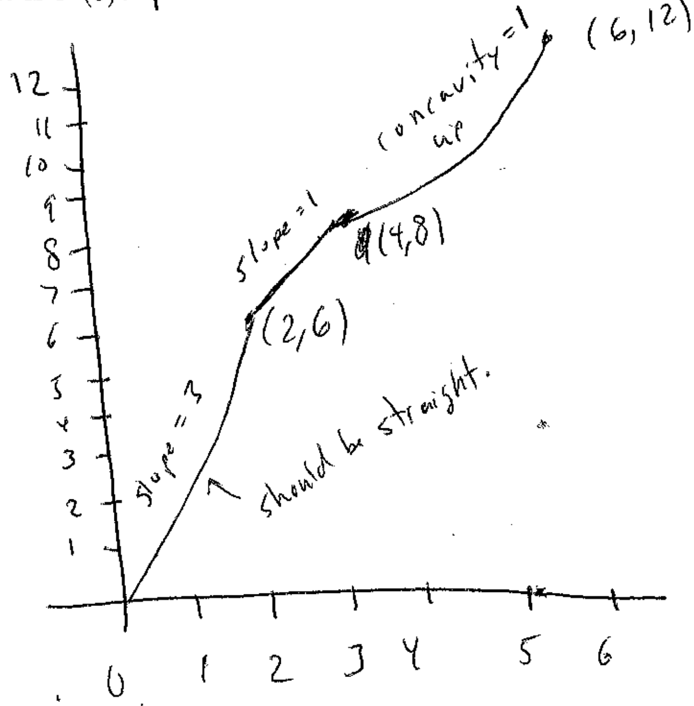


total area = 12.

Figure 1: Graph of $v(t)$

On the interval $(4, 6)$ is your graph is concave up or concave down? up
What is $s(6)$? 12
What is $s'(2)$? undefined
What is $s'(5)$? 2
What is $s''(5)$? 1

In the first two seconds we are going 3 ft/s, so $2 \times 3 = 6$ ft.
In the next two seconds we are going 1 ft/s.
$6 + 2 \cdot 1 = 8$ ft.
In the last 2 seconds we are accelerating.



2. [10 points] Set up the Riemann sum to approximate the area between $y = \ln x$ and the x-axis between $x = 1$ and $x = 3$ with $n = 6$ using **right end points.**

What is Δx? What are the values of x_0, x_1, etc.?

$$\Delta x = \frac{3-1}{6} = \frac{2}{6} = \frac{1}{3}.$$

$x_0 = 1$

$x_1 = \frac{4}{3}$

$x_2 = \frac{5}{3}$

$x_3 = 2$

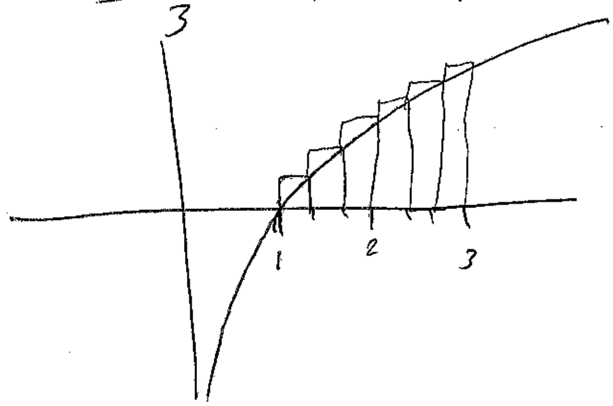
$x_4 = \frac{7}{3}$

$x_5 = \frac{8}{3}$

$x_6 = 3$

$$\sum_{i=1}^{6} \ln(x_i)\,\Delta x = \ln\left(\tfrac{4}{3}\right)\cdot\tfrac{1}{3} + \ln\left(\tfrac{5}{3}\right)\tfrac{1}{3} + \ln(2)\,\tfrac{1}{3} + \ln\left(\tfrac{7}{3}\right)\cdot\tfrac{1}{3} + \ln\left(\tfrac{8}{3}\right)\cdot\tfrac{1}{3} + \ln(3)\cdot\tfrac{1}{3}$$

$$= \frac{4.41834\ldots}{3} = 1.472798$$



Exact answer turns out to be

$$\int_1^3 \ln x\,dx = x\ln x - x \Big|_1^3 = (3\ln 3 - 3) - (1\cancel{\ln 1}^{0} - 1)$$

$$(3\ln 3) - 2 \approx 0.157224577$$

So, $n=6$ is not a very good approximation!