Quiz 6, Calculus I

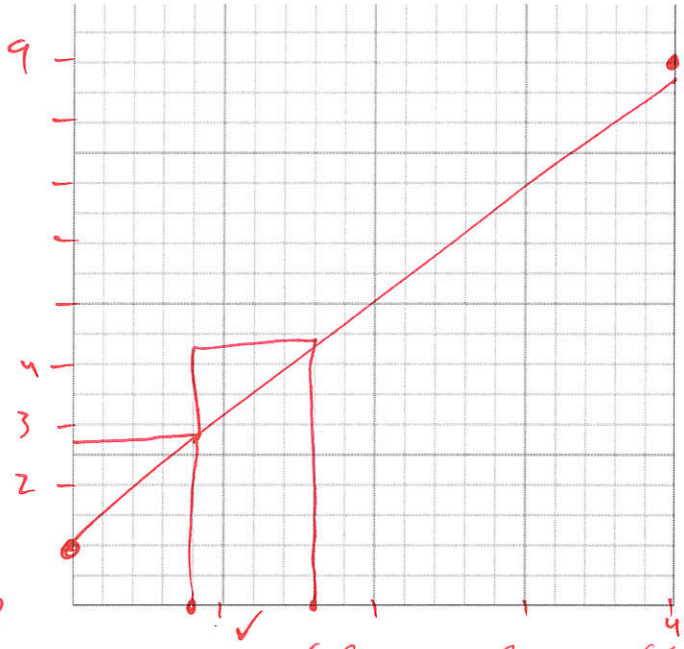
Dr. Adam Graham-Squire, Fall 2017

Name: Key

4:30 => 20 min.

1. (3 points) Use 5 rectangles and right endpoints to approximate the area under the curve $f(x) = 2x + 1$ on the interval $[0, 4]$. Is your answer an *over*estimate or an *under*estimate? Explain how you know. (Note: you can use the graph below to help you find your answers, but it is not necessary to graph the curve to get full points.)

$\Delta x = \frac{4}{5} = 0.8$



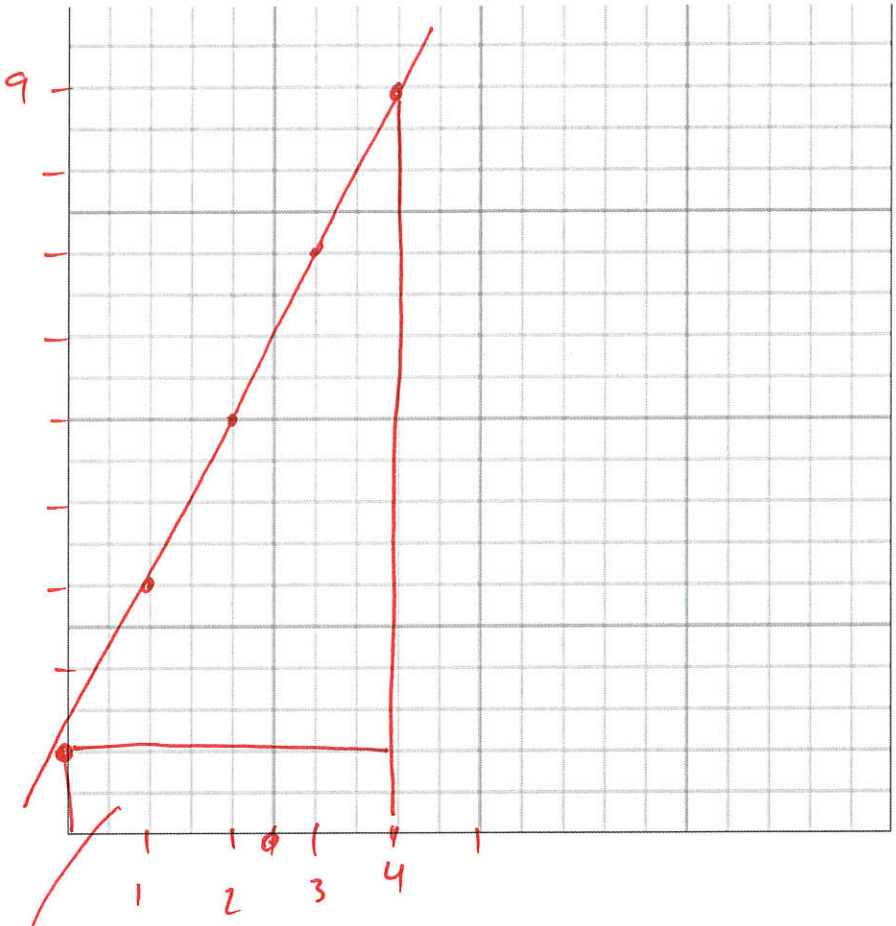
Area $= 0.8\left(f(0.8) + f(1.6) + f(2.4) + f(3.2) + f(4)\right)$ ✓✓

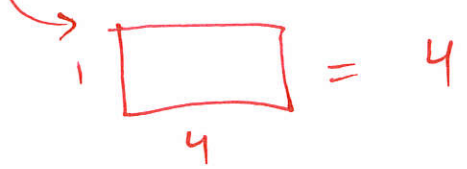
$= 0.8\left(2.6 + 4.2 + 5.8 + 7.4 + 9\right)$ ✓

$= 0.8(29) = \boxed{23.2}$

Overestimate b/c the rectangles are above the line ✓✓

2. (3 points) Use geometry to calculate the exact area under the curve $f(x) = 2x + 1$ on the interval $[0, 4]$. You can check your answer by finding the definite integral, but will only receive full points if you explain your answer through geometric equations for area.





$= 4$

$= \frac{1}{2}(4)(8) = 16$

$4 + 16 = \boxed{20}$

No points off for small calculation errors.

3. (4 points) Use antiderivatives to evaluate the definite integral

$$\int_1^e (x^4 + \frac{1}{x})dx$$

Simplify your answer as much as possible, but you should leave your answer in exact form (no decimal approximation).

$= \int_1^e \left(x^4 + \frac{1}{x}\right) dx$

$= \frac{x^5}{5} + \ln x \Big|_1^e$ ✓ ✓

$= \frac{e^5}{5} + \ln(e) - \left(\frac{1^5}{5} + \ln(1)\right)$ ✓

$= \frac{e^5}{5} + 1 - \frac{1}{5} - 0$ ✓

$= \boxed{\frac{e^5}{5} + \frac{4}{5}}$