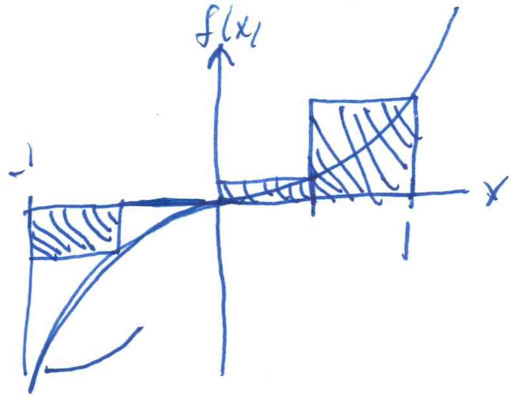
Math 120 Spring 2014 Quiz **One**

SHOW ALL YOUR WORK

1 (a) (*6 points*) Give an estimate for the value of $\int_{-1}^{1} x^3 dx$ using a RIGHT HAND Riemann Sum with four rectangles of equal width. Call this value R_4.



$$R_4 \approx \frac{1}{2} f(1) + \frac{1}{2} f\left(\frac{1}{2}\right) + \frac{1}{2} f(0) + \frac{1}{2} f\left(-\frac{1}{2}\right)$$

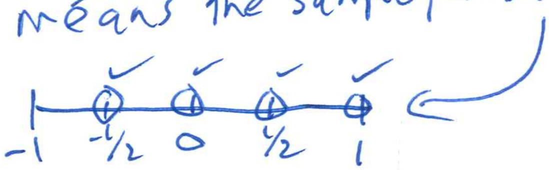
$$\approx \frac{1}{2}\left[1^3 + \left(\frac{1}{2}\right)^3 + 0^3 + \left(-\frac{1}{2}\right)^3\right]$$

$$= \frac{1}{2}\left[1 - \frac{1}{8} + 0 - \frac{1}{8}\right]$$

$$= \frac{1}{2}$$

$$\Delta x = \frac{1 - -1}{4} = \frac{2}{4} = \frac{1}{2}$$

Right Hand Sum means the sample points are



1 (b) (*4 points*) Is R_4, the estimate you computed in (a), an over-estimate or under-estimate of the exact value of $\int_{-1}^{1} x^3 dx$? If you repeated your estimate with a much larger number of rectangles $N > 4$, would your estimate R_N be equal to, less than, or greater than R_4?

R_4 is an over estimate, which is clear from the picture (and the fact ~~over the~~ that the SIGNED area represented by $\int_{-1}^{1} x^3 dx$ is zero!)

When $N > 4$ the estimate R_N will become more accurate so $R_N < R_4$.