Problem Set 4, MATH PREFRESHER: Integrals

Show work where appropriate. It will be most helpful for you to write your answers as completely as possible.

1. Integrals: Foundations
   (a) What is an integral (e.g. what does it do?)
   (b) Why would we use an integral?
   (c) Calculate the area under x^3 on $[1, 4]$ using rectangles.
   (d) (Follow up) Now, calculate the area a second time using smaller rectangles.
   (e) (Follow up) How do these areas compare? How does your finding here relate to the definition of an integral (above)?
2. Integration Practice: Calculate the definite integrals for the following
   (a) $\int_1^4 x^3 dx$
   (b) $\int_0^3 x dx$
   (c) $\int_1^4 (6x^3 - 2) dx$
   (d) $\int_4^6 x dx$
   (e) $\int_0^y (e^x - 2x^2) dx$
3. Iterated Integration Practice: Calculate the following
   (a) $\int_1^4 \int_0^2 (6x^3 - 2y)\ dx\ dy$
   (b) $\int_0^1 \int_1^x 3x - 4\ dy\ dx$
   (c) $\int_0^1 \int_1^y 3x - 4\ dx\ dy$