MATH 2B: 4.9 - 5.1: Antiderivatives and Area

1. Find the most general antiderivative for the following functions.
   $f(x) = 4x + 7$ $\quad$ $f(x) = 7x^{2/4} + 8x^{-4/5}$ $\quad$ $h(x) = 2\sin x - \sec^2 x$

   $f(s) = 2^s + \sec s \tan s$ $\quad$ $h(v) = 1 + 2\cos v + 3/\sqrt{v}$

2. Find f.
   $f''(x) = 20x^3 - 12x^2 + 6x$ $\quad$ $f'(x) = 5x^4 - 3x^2 + \dfrac{3}{1+x^2},\ f(0) = 0$

   $f'(x) = \dfrac{x+1}{\sqrt{x}}$ $\quad$ $f''(x) = e^x - 2\sin x,\ f(0) = 3,\ f(\pi/2) = 3$

3. Consider the curve $y = x^2$ on the interval $[1, 3]$.

   (a) Is y increasing or decreasing on this interval?

   (b) Estimate the area under y on $[1, 3]$ using left endpoints and 4 rectangles. Is your estimate an underestimate or an overestimate?

   (c) Repeat part (b) using right endpoints. Is this an underestimate or an overestimate?

   (d) If a function f is increasing on $[a, b]$, then based upon your answers above, choose "Over" or "Under" in each part below.

      i. Estimating the area under f using left endpoints will result in an (Over/Under) estimate.

      ii. Estimating the area under f using right endpoints will result in an (Over/Under) estimate.

   (e) What do you think will happen when estimating the area under the curve of a function g that is decreasing on $[a, b]$? Test this by estimating the area under $g(x) = 6 - x^2$ on $[0, 2]$ using both left and right endpoints and 4 rectangles.