Practice with Derivatives and Anti-Derivatives

1. Take the derivative of the following functions:

   (a) $f(x) = \frac{1}{x}$

   (b) $f(x) = \ln(x)$

   (c) $f(x) = \sqrt{x} + 4x^{3/2}$

   (d) $f(x) = x^2 \sin x$

   (e) $f(x) = \sin(x^2)$

2. Find the following anti-derivatives:

$$\int 4x \, dx \tag{1}$$

$$\int \frac{4}{x} \, dx \tag{2}$$

$$\int (y + y^2 + y^3) \, dy \tag{3}$$

$$\int 2\sin(x) \, dx \tag{4}$$

$$\int 4t \, dt \tag{5}$$

3. Find the following definite integrals:

$$\int_0^4 x \, dx \tag{6}$$

$$\int_0^{2\pi} \cos(x) \, dx \tag{7}$$

$$\int_2^3 e^x \, dx \tag{8}$$

$$\int_{-2}^2 y^3 \, dy \tag{9}$$

$$\int_0^4 t \, dt \tag{10}$$

4. What to you notice about integrals 6 and 10? Discuss.