## WORKSHEET 26

More Fundamental Theorem of Calculus

28 April 2020

1. (**Review**) Find the y' by using implicit differentiation for  $2y^3 + 4x^2 - y = x^6$ .

Recall the two parts of the Fundamental Theorem of Calculus:

**Theorem.** Suppose f is continuous on [a, b]. If x is in (a, b), then

$$\frac{d}{dx}\int_{a}^{x}f(t)\,dt = f(x)$$

**Theorem.** Suppose f is continuous on [a, b]. If F is an antiderivative of f, then

$$\int_{a}^{b} f(x) \, dx = F(b) - F(a)$$

2. Evaluate the following:

(a) 
$$\frac{d}{dx} \int_{2}^{x} \frac{\cos(t^{2})t^{t}}{t + \sin(e^{t})} dt$$
  
(b) 
$$\frac{d}{dx} \int_{2}^{e^{x}} 3t^{2} e^{\sin(t)} dt$$

3. Evaluate the following definite integrals:

(a) 
$$\int_{0}^{2} x^{2}(3-4x) dx$$
  
(b)  $\int_{3}^{2} e^{x} + \frac{1}{x^{2}+1} dx$   
(c)  $\int_{3}^{6} |2x-10| dx$ 

4. Suppose that 
$$\int_{0}^{6} f(x) dx = 3$$
 and  $\int_{3}^{0} 2f(x) dx = 1$ . What is  $\int_{3}^{6} f(x) - 1 dx$ ?

5. Consider the following three integrals:

$$\int_{a}^{b} f(x) dx \qquad \int_{a}^{b} |f(x)| dx \qquad \left| \int_{a}^{b} f(x) dx \right|$$

What order should they be in so that they are increasing? (i.e., fill in the blanks of the following)