Section 5.4

After viewing the lecture videos and reading the textbook, you should be able to answer the following questions:

- 1. The Fundamental Theorem of Calculus states:
 - If f is continuous on [a,b], then $F(x)=\int_a^x f(t)\,dt$ is continuous on [a,b] and differentiable on (a,b) and

$$F'(x) = \frac{d}{dx} \left(\int_{a}^{x} f(t) \, dt \right) = f(x)$$

• If f is continuous on [a, b] and F is any antiderivative of f on [a, b], then

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

Evaluate:

- a. $\frac{d}{dx} \left(\int_{-2}^{x} \sqrt{1 + t^4} \, dt \right)$
- b. $\int_{1}^{2} \frac{1}{x} dx$
- c. $\int_{1}^{2} \left(\frac{d}{dx} \left(\sqrt{1 + x^2} \right) \right) dx$
- 2. Area is always a nonnegative quantity. Set up an integral or a sum of integrals to evaluate the area of the region between the curve $y=x^3-x^2-2x$ and the x-axis (see the graph below). (Do NOT evaluate the integral.)

