## Review

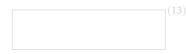
§5.3 (Indefinite Integrals); §5.4, §5.5 (FTC)

MATH 1910 Recitation September 6, 2016

- (1) F is called an **antiderivative** of f if
- (2) Any two antiderivatives of f on an interval (a, b) differ by a constant.
- (3) **Fundamental Theorem of Calculus, Part I (FTC I):** if F(x) is an antiderivative for f(x), then

(2)

- (4) (a)  $\int 0 dx =$  (3)
  - (b)  $\int k \, dx =$
  - (c)  $\int cf(x) dx =$
  - (d)  $\int (f(x) + g(x)) dx =$  (6) +
  - (e)  $\int x^n dx = \begin{bmatrix} 8 \\ 1 \end{bmatrix}$
  - (f)  $\int \sin x \, dx = \frac{1}{2} \int_{-\infty}^{\infty} e^{-x} \, dx$
  - (g)  $\int \sec^2 x \, dx = \boxed{ }$
  - (h)  $\int \sec x \tan x \, dx =$
- (5) To solve an initial value problem dy/dx = f(x),  $y(x_0) = y_0$ , first find the general antiderivative y = F(x) + C. Then determine C using the initial condition  $F(x_0) + C = y_0$ .
- (6) The **area function** with lower limit a is  $A(x) = \begin{bmatrix} 12 \\ 12 \end{bmatrix}$ .
- (7) Fundamental Theorem of Calculus, Part II (FTC II):



- (8) A consequence of FTC II is that every continuous function has an antiderivative.
- (9) Let  $G(x) = \int_a^{g(x)} f(t) dt$ . Let  $A(x) = \int_a^x f(t) dt$ . Then

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

 $\S5.3$  (Indefinite Integrals);  $\S5.4$ ,  $\S5.5$  (FTC)

(1) Evaluate the integral:

(a) 
$$\int \cos x \, dx$$

(b) 
$$\int \csc x \cot x \, dx$$

$$(c) \int \frac{3}{x^{3/2}} dx$$

(d) 
$$\int_{-2}^{2} (10x^9 + 3x^5) dx$$

(e) 
$$\int_0^4 \sqrt{x} \, dx$$

(f) 
$$\int_{\pi/4}^{3\pi/4} \sin\theta \, d\theta$$

(g) 
$$\int_{0}^{5} |x^2 - 4x + 3| dx$$

(h) 
$$\int_{4}^{9} \frac{16+t}{t^2} dt$$

- (2) Solve the differential equation  $\frac{dy}{dx} = 8x^3 + 3x^2 3$  with initial condition y(1) = 1.
- (3) Given that  $f''(x) = x^3 2x + 1$ , f'(0) = 1, and f(0) = 0, find f' and then find f.
- (4) If  $G(x) = \int_1^x \tan t \, dt$ , find G(1) and  $G'(\pi/4)$ .
- (5) Find a formula for the function represented by the integral:  $\int_2^x (t^2 t) dt$ .
- (6) Express the antiderivative F(x) of f(x) as an integral, given that  $f(x) = \sqrt{x^4 + 1}$  and F(3) = 0.
- (7) Calculate the derivative:  $\frac{d}{dx} \int_{1}^{x^3} \tan t \, dt$ .