Name:_____

Notesheet. Section 6.5: Evaluation of Definite Integrals

Math 1220

Definition 1. (a) We define the indefinite integral of $f(x)$ to be

$$\int f(x)\ dx =$$

(b) We define the definite integral from a to b of $f(x)$ to be

$$\int_a^b f(x)\ dx =$$

Note, if $f(x) \geq 0$, then $\int_a^b f(x)\ dx =$

Theorem 2. (a) (Fundamental Theorem of Calculus) If f is continuous on $[a, b]$, then

$$\int_a^b f(x)\ dx =$$

where F is any antiderivative of f.

(b) (Net Change Theorem) If f is differentiable on (a, b) and f' is continuous on (a, b), then

$$\int_a^b f'(x)\ dx =$$

(c) (Average Value Formula) The average value of an integrable function f on $[a, b]$ is

Challenge 3. Compute the following indefinite integrals

(a) $\int (2e^x + 4\cos x)\ dx$

(b) $\displaystyle\int \cos(x)\sin(\sin x)\ dx$

(c) $\displaystyle\int \frac{\sin(\ln x)}{x}\ dx$

Challenge 4. What is the average value of $f(x) = \cos x$ on $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$?

Challenge 5. Using geometric reasoning, what is the area of the region bounded above by $f(x) = 1$ on $[0, 1]$ and bounded below by $g(x) = x$ on $[0, 1]$. Express this area as a combination of definite integrals.