

MATH 3B WORKSHEET 4

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1. QUICK REVIEW

Table of Indefinite integrals:

- (1) (C is a constant) $\int C f(x) dx =$
- (2) $\int [f(x) + g(x)] dx =$
- (3) (k is a constant) $\int k dx =$
- (4) $\int x^n dx =$
- (5) $\int e^x dx =$
- (6) (b is a constant) $\int b^x dx =$
- (7) $\int \sin x dx =$
- (8) $\int \cos x dx =$
- (9) $\int \sec^2 x dx =$
- (10) $\int \csc^2 x dx =$
- (11) $\int \sec x \tan x dx =$
- (12) $\int \csc x \cot x dx =$
- (13) $\int \frac{1}{x^2+1} dx =$
- (14) $\int \frac{1}{\sqrt{1-x^2}} dx =$

Some useful trigonometry identities:

- (1) definitions of tan, cot, sec, csc:
- (2) Three Pythagorean identities:

	$-x$	$\frac{\pi}{2} - x$	$\pi - x$	$x + \frac{\pi}{2}$	$x - \frac{\pi}{2}$
(3) sin					
cos					
tan					
cot					
sec					
csc					

- (4) $\sin(x + y) =$
- (5) $\sin(x - y) =$
- (6) $\cos(x + y) =$
- (7) $\cos(x - y) =$
- (8) $\sin(2x) =$
- (9) $\cos(2x) =$

2. PRACTICE PROBLEMS

2.1. Find the Integrals.

(1) $\int (3 + \frac{4}{5}x^4 + \frac{7}{6}x^7) dx$

(2) $\int (u + 1)(u^2 + 1) du$

(3) $\int \frac{1+x+x^2}{\sqrt{x}} dx$

(4) $\int \left(x^2 + 1 + \frac{1}{1+x^2} \right) dx$

(5) $\int \left(\frac{1+r}{r} \right)^2 dr$

(6) $\int_0^1 (x^{10} + 10^x) dx$

(7) $\int_0^{\pi/4} \sec \theta \tan \theta d\theta$

(8) $\int_{\pi/6}^{\pi/4} \frac{1+\cos^2 \theta}{\cos^2 \theta} d\theta$

(9) * $\int \cot^2 x dx$

(10) $\int_0^{\pi/3} \frac{\sin \theta + \sin \theta \tan^2 \theta}{\sec^2 \theta} d\theta$

$$(11) \int_{\sqrt{2}/2}^{\sqrt{3}/2} \frac{dr}{\sqrt{1-r^2}}$$

$$(12) \int_0^{3\pi/2} |\sin x| dx$$

$$(13) \int_0^4 |(x-1)(x-2)(x-3)| dx$$

2.2. The Net Change Theorem.

- (1) The current in a wire is defined as the derivative of the charge: $I(t) = Q'(t)$. What does $\int_a^b I(t)dt$ represent?

- (2) If oil leaks from a tank at a rate of $r(t) = 100e^{-0.01t}$ gallons per minute at time t in minutes. How much oil will leak in the first two hours?

- (3) If x is measured in feet and $f(x)$ is measured in newtons, what are the units for $\int_0^{100} f(x)dx$? For $f'(x)$? For $\int_0^{100} x^2 f(x)dx$?

- (4) A ball is having velocity $v(t) = \sqrt{3}\sin t + 2$ in feet per second, where t is measured in seconds. The ball is starting at $s(0) = 5$. Where is the ball at $t = \frac{19\pi}{6}$? What's the total distance travelled during this period?

3. QUIZZES

NAME:----- PERM:----- SECTION TIME:-----

Let

$$g(x) = \int_{\tan x}^{\sec x} 5t dt.$$

(1) Use the Fundamental Theorem of Calculus (I) to find out $g'(x)$.

(2) Check your answer by first use the Fundamental Theorem of Calculus (II) to find out $g(x)$, then take the derivative of that.