Math 252 Homework 15 Written Part **Name:** KEY

Write legibly. Show your work. Graph neatly. Use a ruler for all straight lines.

Integration by Tables:

Find each integral by refering to the table of integrals on your handout. Use substitution as needed, showing your work. Specify which formula you use. Think about how you could check each of these.

(1) $\int \frac{1}{9+x^2}\,dx$

#17 $a=3$ $u=x$

$$\boxed{= \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right)+C}$$

(2) $\int \frac{1}{9-x^2}\,dx$

#19 $a=3$ $u=x$

$$\boxed{= \frac{1}{6}\ln\left|\frac{x+3}{x-3}\right|+C}$$

(3) $\int \frac{1}{x^2-9}\,dx$

#20 $a=3$ $u=x$

$$\boxed{= \frac{1}{6}\ln\left|\frac{x-3}{x+3}\right|+C}$$

(4) $\int \cot(5x)\,dx$

Let $u=5x$

$du = 5\,dx$

$\frac{1}{5}du = dx$

$$= \frac{1}{5}\int \cot(u)\,du$$

#13

$$= \frac{1}{5}\left[\ln|\sin(u)|\right]+C$$

$$\boxed{= \frac{1}{5}\ln|\sin(5x)|+C}$$

(5) $\int \frac{1}{\sqrt{1-4x^2}}dx$

[let $u = 2x$
$du = 2dx$
$\frac{1}{2}du = dx$

$= \frac{1}{2}\int \frac{1}{\sqrt{1-u^2}}\,du$

#16, $a=1$

$= \frac{1}{2}\left[\sin^{-1}\left(\frac{u}{1}\right)\right] + C$ $\boxed{= \frac{1}{2}\sin^{-1}(2x) + C}$

(6) $\int \frac{1}{\sqrt{4x^2-1}}dx$

[let $u = 2x$
$\frac{1}{2}du = dx$

$= \frac{1}{2}\int \frac{1}{\sqrt{u^2-1}}\,du$

#43, $a=1$

$= \frac{1}{2}\left[\ln\left|u + \sqrt{u^2-1^2}\right|\right] + C$

$\boxed{= \frac{1}{2}\ln\left|2x + \sqrt{4x^2-1}\right| + C}$

(7) $\int \sec^3(\pi x)dx$

[let $u = \pi x$
$du = \pi dx$
$\frac{1}{\pi}du = dx$

$= \frac{1}{\pi}\int \sec^3(u)\,du$

#71

$= \frac{1}{\pi}\left[\frac{1}{2}\sec(u)\tan(u) + \frac{1}{2}\ln\left|\sec(u) + \tan(u)\right|\right] + C$

$\boxed{= \frac{1}{2\pi}\left[\sec(\pi x)\tan(\pi x) + \ln\left|\sec(\pi x) + \tan(\pi x)\right|\right] + C}$

(8) $\int \sin^2(3x+1)dx$

[let $u = 3x+1$
$du = 3dx$
$\frac{1}{3}du = dx$

$= \frac{1}{3}\int \sin^2(u)\,du$

#63

$= \frac{1}{3}\left[\frac{u}{2} - \frac{1}{4}\sin(2u)\right] + C$

$\boxed{= \frac{1}{3}\left[\frac{3x+1}{2} - \frac{1}{4}\sin(6x+2)\right] + C}$

(9) $\int \frac{x^2}{\sqrt{2+5x}}dx$

#56, $u = x$, $a = 2$, $b = 5$

$= \frac{2}{15(5)^3}\left(8(2)^2 + 3(5)^2x^2 - 4(2)(5)x\right) \cdot \sqrt{2+5x} + C$

$\boxed{= \frac{1}{1875}\left(32 + 75x^2 - 40x\right)\sqrt{2+5x} + C}$

(10) $\int 2\cos^2(5t)\,dt$

[let $u = 5t$
$du = 5dt$
$\frac{1}{5}du = dt$

$= \frac{2}{5}\int \cos^2(u)\,du$

#64

$= \frac{2}{5}\left[\frac{u}{2} + \frac{1}{4}\sin(2u)\right] + C$

$= \frac{2}{5}\left[\frac{5t}{2} + \frac{1}{4}\sin(10t)\right] + C$

$\boxed{= t + \frac{1}{10}\sin(10t) + C}$