Math 132 - Homework 3

March 3, 2021

Name key

Score _____

The following problems are from the suggested homework. Show all work to receive full credit. Supply explanations when necessary. This assignment is due on March 10.

1. (2 points) Integrate: $\int x^2 \sin(3x^3 + 2)\, dx$

$u = 3x^3 + 2$

$du = 9x^2\, dx$

$\frac{1}{9}\, du = x^2\, dx$

$\frac{1}{9}\int \sin u\, du$

$= -\frac{1}{9}\cos u + C$

$= \boxed{-\frac{1}{9}\cos(3x^3 + 2) + C}$

2. (2 points) Determine the exact value of $\int_0^{\pi/2} x^2 \sin x\, dx$

SIGNS	u & DERIVS	dv/dx & ANTIS
+ →	x^2	$\sin x$
− →	$2x$	$-\cos x$
+ →	2	$-\sin x$
−	0	$\cos x$

$-x^2\cos x + 2x\sin x + 2\cos x \Big|_0^{\pi/2}$

$= \boxed{\pi - 2}$

Turn over.

3. (2 points) Integrate: $\int \tan^5(2x)\sec^2(2x)\,dx$ $= \frac{1}{2}\int u^5\,du$

LET $u = \tan 2x$

$du = 2\sec^2 2x\,dx$

$\frac{1}{2}du = \sec^2 2x\,dx$

$= \frac{1}{12}u^6 + C$

$= \boxed{\frac{1}{12}\tan^6 2x + C}$

4. (2 points) Integrate: $\int \sin^3 x\,dx = \int (1-\cos^2 x)\sin x\,dx$

$u = \cos x$

$du = -\sin x\,dx$

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

$= \boxed{\frac{1}{3}\cos^3 x - \cos x + C}$

5. (2 points) Integrate: $\int \sqrt{x^2+9}\,dx$

LET $x = 3\tan\theta$, $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$

$dx = 3\sec^2\theta\,d\theta$

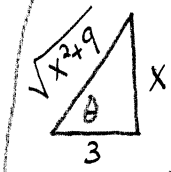
$\int \sqrt{9\tan^2\theta + 9}\; 3\sec^2\theta\,d\theta$

$= \int \sqrt{9\sec^2\theta}\; 3\sec^2\theta\,d\theta$

$= 9\int \sec^3\theta\,d\theta$

$= \frac{9}{2}\sec\theta\tan\theta + \frac{9}{2}\ln|\sec\theta + \tan\theta| + C$

(SEE ATTACHED PAGE)



$= \boxed{\frac{9}{2}\frac{\sqrt{x^2+9}}{3}\frac{x}{3} + \frac{9}{2}\ln\left|\frac{\sqrt{x^2+9}}{3} + \frac{x}{3}\right| + C}$

Some work For #5

$$\int \sec^3\theta \, d\theta$$

$u = \sec\theta \qquad du = \sec\theta \tan\theta \, d\theta$

$dv = \sec^2\theta \qquad v = \tan\theta$

$$\int \sec^3\theta \, d\theta = \sec\theta\tan\theta - \int \sec\theta \tan^2\theta \, d\theta$$

$$= \sec\theta\tan\theta - \int \sec\theta(\sec^2\theta - 1)\, d\theta$$

$$= \sec\theta\tan\theta - \int \sec^3\theta \, d\theta + \int \sec\theta \, d\theta$$

$$2\int \sec^3\theta \, d\theta = \sec\theta\tan\theta + \ln|\sec\theta + \tan\theta| + C$$

$$\int \sec^3\theta \, d\theta = \frac{1}{2}\sec\theta\tan\theta + \frac{1}{2}\ln|\sec\theta + \tan\theta| + C$$