Quiz #2 score______/30 **Name** Key

Math 236

Spring 2008

SHOW WORK

1. Evaluate the following integral $\int \tan^{-1}(2x)\,dx$ IBPs! $\int u\,dv = uv - \int v\,du$ 8 pts.

Let $u = \tan^{-1}(2x)$ $dv = dx$

$du = \frac{1}{1+(2x)^2}\cdot(2)\,dx$ $v = x$

so

$$\int \tan^{-1}(2x)\,dx = x\tan^{-1}(2x) - \int \frac{2x}{1+4x^2}\,dx$$

$u = \cancel{1}+4x^2$

$du = 8x\,dx$

$\frac{1}{4}du = 2x\,dx$

$$= x\tan^{-1}(2x) - \frac{1}{4}\int \frac{du}{u} = \boxed{x\tan^{-1}(2x) - \frac{1}{4}\ln|1+4x^2| + C}$$

2. Evaluate the following integral $\int \frac{dx}{x^2\sqrt{4x^2-9}}$ Let $u = 2x$ so $x = \frac{u}{2}$; $du = 2dx$ so $\frac{1}{2}du = dx$ 8 pts.

$$\frac{1}{2}\int \frac{du}{\frac{1}{4}u^2\sqrt{u^2-3^2}}$$

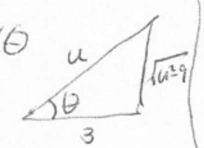
$$= 2\int \frac{du}{u^2\sqrt{u^2-3^2}}$$

Let $u = 3\sec\theta$

$du = 3\sec\theta\tan\theta\,d\theta$

$u^2 - 9 = 9\tan^2\theta$

$\sqrt{u^2-9} = 3\tan\theta$



$\sin\theta = \frac{\sqrt{u^2-9}}{u}$ but $u = 2x$

$= \frac{\sqrt{4x^2-9}}{2x}$

$$= 2\int \frac{\cancel{3}\sec\theta\cancel{\tan\theta}\,d\theta}{9\sec^2\theta\,\cancel{3}\cancel{\tan\theta}} = \frac{2}{9}\int \frac{1}{\sec\theta}\,d\theta = \frac{2}{9}\int \cos\theta\,d\theta = \frac{2}{9}\sin\theta + C = \frac{2}{9}\frac{\sqrt{4x^2-9}}{2x} + C$$

$$= \boxed{\frac{\sqrt{4x^2-9}}{9x} + C}$$

3. Evaluate the following integral $\int \cos^4(x)\,\sin^3(x)\,dx = \int \cos^4 x \sin^2 x \sin x\,dx$ 8 pts.

$$= \int \cos^4 x(1-\cos^2 x)\sin x\,dx$$

$$= \int (\cos^4 x - \cos^6 x)\sin x\,dx$$

$u = \cos x$

$du = -\sin x\,dx$

$-du = \sin x\,dx$

$$= -\int (u^4 - u^6)\,du$$

$$= \int (u^6 - u^4)\,du = \frac{u^7}{7} - \frac{u^5}{5} + C = \boxed{\frac{\cos^7(x)}{7} - \frac{\cos^5 x}{5} + C}$$

4. Evaluate the following integral $\int \sec^2(3x+1)\,dx$ 6 pts.

$u = 3x+1$

$du = 3\,dx$

$\frac{1}{3}du = dx$

$$= \frac{1}{3}\int \sec^2 u\,du$$

$$= \frac{1}{3}\tan u + C$$

$$\boxed{= \frac{1}{3}\tan(3x+1) + C}$$