Warm Up - Feb 2

Use substitution to evaluate the integral

1 $\int x^3\sqrt{x^4-2}\,dx$

$u = x^4 - 2$

$du = 4x^3\,dx$

$\frac{1}{4}du = x^3\,dx$

$\frac{1}{4}\int \sqrt{u}\,du$

$\frac{1}{4}\int u^{1/2}\,du$

$\frac{1}{\cancel{4}_2}\cdot\frac{\cancel{2}}{3}u^{\frac{3}{2}} + C$

$= \frac{1}{6}(x^4-2)^{\frac{3}{2}} + C$

2. $\int tan^7x \cdot sec^2x\,dx$

$u = \tan x$

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

$\int u^7\,du$

$= \frac{u^8}{8} + C = \frac{(\tan x)^8}{8} + C$

$\frac{\tan^8 x}{8} + C$

3. $\int tanx\,dx$ *Hint: rewrite*

$\int \frac{\sin x}{\cos x}\,dx \quad -\int \frac{1}{u}\,du$

$u = \cos x$

$du = -\sin x\,dx$

$-du = \sin x\,dx$

$= -\ln|u| + C$

$= -\ln|\cos x| + C$

4. $\int_{-1}^{1} \frac{5r}{(4+r^2)^2}\,dr$

$u(1) = 4 + (1)^2 = 5$

$u(-1) = 4 + (-1)^2 = 5$

$u = 4 + r^2$

$\frac{5}{2}du = \frac{5}{\cancel{2}}\cancel{2}r\,dr$

$\frac{5}{2}du = 5r\,dr$

$\frac{5}{2}\int_5^5 \frac{1}{u^2}\,du$

$= \frac{5}{2}(0)$

$= 0$

Solve for y

Hints: $\frac{1}{\cos^2\theta} = \sec^2\theta$ and $u = \sqrt{y}$

5. $\frac{dy}{dx} = x\sqrt{y}\cdot cos^2\sqrt{y}$

$\left(\frac{\cancel{dx}}{\sqrt{y}\cos^2\sqrt{y}}\right)\frac{dy}{\cancel{dx}} = x(\cancel{\sqrt{y}\cos^2\sqrt{y}})\left(\frac{dx}{\cancel{\sqrt{y}\cos^2\sqrt{y}}}\right)$

$\frac{1}{\sqrt{y}\cos^2\sqrt{y}}\,dy = x\cdot dx$

$\int \frac{1}{\sqrt{y}}\sec^2\sqrt{y}\,dy = \int x\,dx$

$u = \sqrt{y} = y^{1/2}$

$du = \frac{1}{2}y^{-1/2}\,dy$

$du = \frac{1}{2}\frac{1}{\sqrt{y}}\,dy$

$2\,du = \frac{1}{\sqrt{y}}\,dy$

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

$2\tan u = \frac{x^2}{2} + C$

$2\tan(\sqrt{y}) = \frac{x^2}{2} + C$

$\tan^{-1}\left(\tan(\sqrt{y})\right) = \tan^{-1}\left(\frac{x^2}{4} + C\right)$

$\sqrt{y} = \tan^{-1}\left(\frac{x^2}{4} + C\right)$

$y = \left(\tan^{-1}\left(\frac{x^2}{4} + C\right)\right)^2$