SOLUTIONS TO QUIZ 2

$$y' = (1)(\log_2(x^2-2x))^3 + x\left(3[\log_2(x^2-2x)]^2 \cdot \frac{1}{(x^2-2x)\ln 2} \cdot 2x-2\right.$$

$$= [\log_2(x^2-2x)]^3 + \frac{3\cancel{x}(2)(x-1)}{\cancel{x}(x-2)\ln 2}[\log_2(x^2-2x)]^2$$

$$= [\log_2(x^2-2x)]^3 + \frac{6(x-1)[\log_2(x^2-2x)]^2}{(x-2)\ln 2}$$

$$y' = 2x(\sin^{-1}x)^3 + x^2\left(3 \cdot (\sin^{-1}x)^2 \cdot \frac{1}{\sqrt{1-x^2}} \cdot (1)\right)$$

$$= 2x(\sin^{-1}x)^3 + \frac{3x^2(\sin^{-1}x)^2}{\sqrt{1-x^2}}$$

$$\int_1^{\sqrt{3}} \frac{\sqrt{\tan^{-1}x}}{x^2+1}\,dx \qquad \text{Let} \quad u = \tan^{-1}x, \quad du = \frac{1}{1+x^2}\,dx$$

$$\int_*^* \sqrt{u}\,du \rightarrow \int_*^* u^{1/2}\,du \rightarrow \frac{2}{3}u^{3/2} \rightarrow \frac{2}{3}(\tan^{-1}x)^{3/2}\Big|_1^{\sqrt{3}}$$

$$\rightarrow \frac{2}{3}\left(\left(\tan^{-1}(\sqrt{3})\right)^{3/2} - \left(\tan^{-1}(1)\right)^{3/2}\right)$$

$$\rightarrow \frac{2}{3}\left(\left(\frac{\pi}{3}\right)^{3/2} - \left(\frac{\pi}{4}\right)^{3/2}\right)$$

7. $\int x \tan^{-1} x \, dx$

$\tan^{-1} x$		x
$\frac{1}{1+x^2}$	$-\int$	$\frac{x^2}{2}$

$$\frac{x^2}{2}\tan^{-1}x - \frac{1}{2}\int \frac{x^2}{1+x^2}\,dx$$

or

$u = \tan^{-1} x \qquad dv = x$

$du = \frac{1}{1+x^2}\,dx \qquad v = \frac{x^2}{2}$

$uv - \int v\,du$

$$\frac{x^2}{2}\tan^{-1}x - \frac{1}{2}\int \frac{x^2}{1+x^2}\,dx$$

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$$\begin{array}{r|l} & \;1 \\ \hline x^2+1 & \;x^2 \\ & -(x^2+1\quad) \\ \hline & \quad -1 \end{array}$$

Long Division.

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

$$\frac{x^2}{2}\tan^{-1}x - \frac{1}{2}\int 1\,dx + \frac{1}{2}\int \frac{1}{1+x^2}\,dx$$

$$\frac{x^2}{2}\tan^{-1}x - \frac{1}{2}x + \frac{1}{2}\tan^{-1}x + C$$

$$(x^2+1)\tan^{-1}x - \frac{1}{2}x + C$$