2014/07/15 Summer Math 1432 "Turn it in Lab" 2

- $y = \log(\cos(x))$

Find y' $\Rightarrow$ $y' = \frac{1}{\cos(x)} \cdot -\sin(x) = \boxed{-\tan(x)}$

- $y = \log_5(\tan(x)) = \frac{\ln(\tan(x))}{\ln 5}$

Find y' $\Rightarrow$ $y' = \frac{1}{\ln 5} \cdot \frac{1}{\tan(x)} \cdot \sec(x)\cdot\tan(x) = \boxed{\frac{\sec(x)}{\ln 5}}$

- $\int x\, 5^{x^2} dx \underset{\text{U-substitution}}{\Rightarrow}$ let $u = x^2$, $du = 2x\,dx \Rightarrow \frac{du}{2} = x\,dx$

$\quad ||$

$\int \frac{5^u}{2} du = \frac{1}{2}\int 5^u du = \frac{1}{2}\cdot\frac{1}{\ln 5}\cdot 5^u + C$

$= \boxed{\frac{1}{2}\,\frac{1}{\ln 5}\,5^{x^2} + C}$

- $\int \frac{\log_2 x^3}{x} dx = \int \frac{\ln x^3}{\ln 2}\cdot\frac{1}{x} dx = \int \frac{3}{\ln 2}\cdot\frac{\ln x}{x} dx$

$= \frac{3}{\ln 2}\int \frac{\ln x}{x} dx \underset{\text{u-substitution}}{=} \frac{3}{\ln 2}\int u\,du = \frac{3}{\ln 2}\cdot\frac{u^2}{2} + C$

let $u = \ln x$
$du = \frac{dx}{x}$

$= \boxed{\frac{3}{\ln 2}\cdot\frac{(\ln x)^2}{2} + C}$

- $$\int \frac{\sin(e^{-2x})}{e^{2x}}\,dx \underset{\uparrow}{=} \int \sin(u)\,\frac{du}{-2} = -\frac{1}{2}\int \sin(u)\,du$$

u-substitution

let $u = e^{-2x}$

$du = -2e^{-2x}\,dx$

$\Rightarrow \frac{du}{-2} = \frac{1}{e^{2x}}\,dx$

$$= -\frac{1}{2}(-\cos(u)) + C$$

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

- $$\frac{d}{dx}\left[(\cos(x))^{(x^2+1)}\right] = \frac{d}{dx}\left[e^{\ln(\cos(x))^{(x^2+1)}}\right]$$

$$= \frac{d}{dx}\left[e^{(x^2+1)\ln(\cos(x))}\right]$$

$$= \left[(x^2+1)\ln(\cos(x))\right]' e^{(x^2+1)\ln(\cos(x))} = \left[2x\cdot\ln(\cos(x)) + \frac{x^2+1}{\cos(x)}\cdot(-\sin(x))\right](\cos(x))^{(x^2+1)}$$

$$= \boxed{\left[2x\cdot\ln\cos(x) + (x^2+1)\cdot(-\tan(x))\right](\cos(x))^{(x^2+1)}}$$

- $$\int \frac{4}{x(\ln x)^2}\,dx \underset{\uparrow}{=} \int \frac{4}{u^2}\,du = -\frac{4}{u} + C$$

u-substitution

$u = \ln x$.

$du = \frac{dx}{x}$

$$= \boxed{-\frac{4}{\ln x} + C}$$