In Class Assignment #6 Solutions
NYA Calculus for Electronics

① $f(x) = \ln\left[\dfrac{(\cos^4 x)(x^2+3)}{(\ln x)^9}\right]$

TRICK: Use properties of logarithms to simplify BEFORE finding the derivative

$$f(x) = \ln(\cos^4 x) + \ln(x^2+3) - \ln[(\ln x)^9]$$
$$= 4\ln\cos x + \ln(x^2+3) - 9(\ln(\ln x))$$

$$f'(x) = \frac{4}{\cos x}(-\sin x) + \frac{1}{x^2+3}(2x) - \frac{9}{\ln x}\left(\frac{1}{x}\right)$$

$$= \boxed{-4\tan x + \frac{2x}{x^2+3} - \frac{9}{x\ln x}}$$

② $f(x) = (x^3-2x)^{-9}$

$$\boxed{f'(x) = -9(x^3-2x)^{-10}(3x^2-2)}$$

③ $f(x) = e^x(2x+3/x)^2$

$$\boxed{f'(x) = e^x(2x+3/x)^2 + 2(2x+3/x)(2-3/x^2)e^x}$$

④ $f(x) = \sin(e^x)$

$$\boxed{f'(x) = [\cos(e^x)]\cdot e^x}$$

⑤ $f(x) = \sin(-x)\, e^{-x}$

$f'(x) = \cos(-x)(-1)e^{-x} + e^{-x}(-1)\sin(-x)$

$= \boxed{-e^{-x}(\cos(-x) + \sin(-x))}$

⑥ $f(x) = e^{\frac{3x}{x+1}}$ $\quad \boxed{f'(x) = e^{\frac{3x}{x+1}} \cdot \left(\frac{3(x+1) - 3x}{(x+1)^2}\right)}$

⑦ $f(x) = \frac{xe^x}{2x^3-3x}$

$$\boxed{f'(x) = \frac{(e^x + e^x x)(2x^3-3x) - (6x^2-3)(xe^x)}{(2x^3-3x)^2}}$$

⑧ $f(x) = x^2 e^x \sin x$

$\boxed{f'(x) = (2xe^x + e^x x^2)\sin x + \cos x\,(x^2 e^x)}$

⑨ $f(x) = e^{e^x}$ $\quad \boxed{f'(x) = e^{e^x} \cdot e^x}$

⑩ $f(x) = \sin(\ln\cos x)$ $\quad \boxed{f'(x) = \cos(\ln\cos x) \cdot \frac{1}{\cos x}(-\sin x)}$

⑪ $f(x) = \tan(3x^2)$

$= \frac{\sin(3x^2)}{\cos(3x^2)}$

$$f'(x) = \frac{(\cos(3x^2)) \cdot 6x \cos 3x^2 - (-\sin(3x^2))(6x)\sin(3x^2)}{\cos^2(3x^2)}$$

$$= \frac{[\cos^2(3x^2)]6x + [\sin^2(3x^2)]6x}{\cos^2(3x^2)}$$