Homework 3-3

① $\lim_{x\to 0} \frac{\tan x}{4x} = \frac{\sec^2 x}{4}$

then $N = 1/4$

② $\lim_{x\to 0} \frac{\sin(3x)}{6x} = \frac{3\cos(3x)}{6}$

then $N = 1/2$

③ $\lim_{x\to 0} \frac{\sin(4t)}{\sin(6t)} = \frac{4\cos(4t)}{6\cos(6t)}$

then $N = 2/3$

④ $\lim_{x\to 3} \frac{\sin(x-3)}{x^2+2x-15} = \frac{\cos(x-3)}{2x+2}$

then $N = 1/8$

⑤ $\lim_{\theta\to 0} \frac{\cos(\theta)-1}{6\sin\theta} = \frac{-\sin\theta}{6\cos\theta}$

then $N = 0$

⑥ $f(x) = x^5 \cos x$

$\frac{dy}{dx} = 5x^4\cos x - x^5\sin x$

⑦ $f(x) = 8x(\sin x + \cos(x))$

$f'(x) = 8(\sin x + \cos x) + 8x($

$\cos(x) - \sin(x))$

$f'(\frac{\pi}{4}) = 16/\sqrt{2}$

⑧ $f(x) = 5x \sin x \cos x$

$f'(x) = 5(\sin x \cos x) + 5x(\cos^2 x) -$

$5x\sin^2(x)$

⑨ $f(x) = x^2 \sin x \tan x$

$f'(x) = 2x(\sin x \tan x) + x^2 \sin x +$

$x^2 \sin x \sec^2 x$

⑩ $f(x) = 7x/(\sin x + \cos x)$; $f'(x)$ at π

$f'(x) = \frac{7(\sin x + \cos x) - 7x(\cos x - \sin x)}{2\sin x \cos x + 1}$

$f'(\pi) = 7(-1) - 7\pi(-1) = \boxed{-7+7\pi}$

⑪ $f(x) = 2\tan x/x$; $f'(x)$?

$f'(x) = (2\sec^2 x(x) - 2\tan x)/x^2$

⑫ $\frac{d^{59}y}{dx^{59}}$ of $\sin x$

$\cos x \to -\sin x \to -\cos x \to \sin x$

$59 \% 4 = 3$ then $\boxed{-\cos x}$

⑬ $y = \sin x$; $y = ke^x$; $\sin x = ke^x$

and $y' = \cos x$; $y' = -ke^x$ $k = e^{\frac{3\pi}{4}} \frac{\sqrt{2}}{2}$

then $\sin x = -\cos x = ke^x$

$\tan\theta = -1$ or $\tan^{-1}(-1) = 3\pi/4$

$x = \frac{3\pi}{4}$; $y = \sin(\frac{3\pi}{4}) = \frac{\sqrt{2}}{2}$; $\frac{\sqrt{2}}{2} = ke^{-3\pi/4}$