①

$3\cos^2 x + 6\sin x\cos x + \sin^2 x$

↳ $\sin^2 x + \cos^2 x = 1$ 성질을 이용하여

$3\cos^2 x + 6\left(\sqrt{1-\cos^2 x}\right)\cos x + 1 - \cos^2 x$

$= 2\cos^2 x + 6\left(\sqrt{1-\cos^2 x}\right)\cos x + 1$

$\cos x = 1$ 일때 최대

$\cos x = -1$ 일때 최소 이다.

$\therefore$ $3\cos^2 x + 6\sin x\cos x + \sin^2 x$ 의

$\boxed{\text{최댓값} = 3,\ \text{최솟값} = -3}$ 답

②

$\sin^{-1}\left(\frac{\sqrt{3}}{2}\right) \Rightarrow \frac{\sqrt{3}}{2} = \sin A$, $A = \frac{\pi}{3}$ $\Rightarrow \sin^{-1}\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{3}$

$\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) \Rightarrow -\frac{1}{\sqrt{3}} = \tan(B)$, $B = -\frac{\pi}{6}$ $\Rightarrow \tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) = -\frac{\pi}{6}$

$\cos^{-1}\left(\frac{1}{2}\right) \Rightarrow \frac{1}{2} = \cos(C)$, $C = \frac{\pi}{3}$ $\Rightarrow \cos^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{3}$

$\therefore$ $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right) - \tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) + \cos^{-1}\left(\frac{1}{2}\right)$

$= \frac{\pi}{3} + \frac{\pi}{6} + \frac{\pi}{3}$

$= \boxed{\frac{5}{6}\pi}$ 답.

③ $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n = e$ 이므로

$\lim_{n\to\infty}\left\{\left(1-\frac{1}{n}\right)^{3n}\right\}$

$= \lim_{n\to\infty}\left\{\left(\left(1-\frac{1}{n}\right)^n\right)^3\right\}$

$= \lim_{n\to\infty}\left\{\left(\left(1+\frac{1}{-n}\right)^{-n}\right)^{-3}\right\}$

$= e^{-3}$

$= \boxed{\frac{1}{e^3}}$ 답.

④

$\lim_{x\to 0}\left(e^x + x\right)$

$= e^0 + 0$

$= 1$ $\boxed{\text{답} : 1}$

⑤

$\lim_{x\to 0^-} x + b = b$

$\lim_{x\to 0^+} \cos x = 1$

$\boxed{\therefore\ b = 1}$

⑥

$$y' = 3\left(\frac{x+1}{x-1}\right)^2 \times \frac{1\times(x-1)-(x+1)\times 1}{(x-1)^2} = \underbrace{3\left(\frac{x+1}{x-1}\right)^2 \times \frac{-2}{(x-1)^2}}_{\downarrow}$$

기울기변전식.

기울기 $= -54$

$y = -54x + b$

$27 = -54 \times 2 + b$

$27 = -108 + b$

$b = 108 + 27$

$= 135$

$\therefore \boxed{y = -54x + 135}$

답.

⑦

$x^2 - 2xy + y^3 = 1$

$\hookrightarrow 2x\frac{dx}{dx} - 2\left(y + x\frac{dy}{dx}\right) + 3y^2\frac{dy}{dx} = 0$

$2x - 2\left(y + x\frac{dy}{dx}\right) + 3y\frac{dy}{dx} = 0$

$2x - 2y - 2x\frac{dy}{dx} + 3y^2\frac{dy}{dx} = 0$

$(3y^2 - 2x)\frac{dy}{dx} = -2x + 2y$

$\frac{dy}{dx} = \frac{-2x+2y}{3y^2-2x}$

답: $\frac{-2x+2y}{3y^2-2x}$

⑧

$$\begin{cases} x = t - \sin t \\ y = \cos t \end{cases}$$

$\frac{dx}{dt} = 1 - \cos t$

$\frac{dy}{dt} = -\sin t$.

$\frac{dy'}{dt} = \frac{-\cos t \times (1-\cos t) - (-\sin t)(\sin t)}{(1-\cos t)^2}$

$= \frac{-\cos t + \cos^2 t + \sin^2 t}{(1-\cos t)^2} = \frac{-\cos t + 1}{(1-\cos t)^2}$

$\frac{d^2y}{dx^2} = \frac{-\cos t + 1}{(1-\cos t)^2} \times \frac{1}{1-\cos t}$

$\boxed{= \frac{-\cos t + 1}{(1-\cos t)^3}}$

답.

⑨

$f'(x) = \lim_{\Delta x \to 0} \frac{f(a+\Delta x) - f(a)}{\Delta x} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

$= \lim_{h \to 0} \frac{\log_2(x+h) - \log_2 x}{h}$

$= \lim_{h \to 0} \frac{1}{h}\log_2\left(\frac{x+h}{x}\right) = \lim_{h \to 0} \frac{1}{h}\log_2\left(1 + \frac{h}{x}\right)$

$= \lim_{h \to 0} \frac{1}{x} \cdot \frac{x}{h}\log_2\left(1 + \frac{h}{x}\right)$

$= \lim_{h \to 0} \frac{1}{x}\log_2\left(1 + \frac{h}{x}\right)^{\frac{x}{h}}$

$= \frac{1}{x}\log_2 \lim_{h \to 0}\left(1 + \frac{h}{x}\right)^{\frac{x}{h}}$

$= \frac{1}{x}\log_2 e$

$= \frac{1}{x} \times \frac{1}{\ln 2} = \boxed{\frac{1}{x\ln 2}}$ 답

⑩

$3\cos^2 x + 6\sin x\cos x + S$

$\hookrightarrow \sin^2 x + \cos^2 x = 1$

$3\cos^2 x + 6($

(10)

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

(11)

$$y = (x^2+6x+1)^4 + \operatorname{sech}(2x+5)$$

$$\boxed{y' = 4(x^2+6x+1)^3(2x+6) - 2\operatorname{sech}(2x+5)\tanh(2x+5)}$$

답

(12)

$$\frac{1}{\cosh(3x^2+4)} \times \sinh(3x^2+4) \times 6x$$

$$\boxed{= \frac{\sinh(3x^2+4)\cdot 6x}{\cosh(3x^2+4)}}$$

답

(13)

$$e^{2x}\tanh^{-1}(\sqrt{3x}) + \left(e^{2x} \times \frac{1}{3x+1} \times \frac{1}{2} \times 3x^{-\frac{1}{2}} \times 3\right)$$

$$e^{2x}\tanh^{-1}(\sqrt{3x}) + e^{2x} \times \frac{3}{(3x+1)(2\sqrt{3x})}$$

$$\boxed{= e^{2x}\left(\tanh^{-1}(\sqrt{3x}) + \frac{3}{(3x+1)(2\sqrt{3x})}\right)}$$

답