1) 1. $\sin y \cdot \cos y = \sin' x \cos x + \cos x' \sin x = \cos^2 x - \sin^2 x \cdot \cos^2 \ldots$

2. $(\ln \cdot (2x+1)^3)' = 3\ln(2x+1)^2 \cdot \frac{1}{2x+1} \cdot x$

3. $\sqrt{\sin^2(\ln(x^3))}' = \frac{1}{2\sin^2(\ln(x^3))} \cdot 2\sin(\ln(x^3)) \cdot \frac{1}{x^3} \cdot 3x^2$

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

4. $\left(\frac{x^4}{\ln(x)}\right)' = \frac{4x^3 \ln x - x^3}{\ln(x)} = 4x^3 - \frac{x^3}{\ln x}$

2) $f(x) = \cos(x^2 + 3x)$, $x_0 = \sqrt{\pi}$

$f'(x) = \sin(x^2+3x)(2x+3)$

$f'(\pi) = \sin(4\pi) \cdot (2\sqrt{\pi}+3) = 0$

3) $f(x) = \frac{x^3 - x^2 - x - 1}{1 + 2x + 3x^2 - 4x^3}$, $x_0 = 0$

$f'(x) = \frac{(3x^2 - 2x - 1)(1 + 2x + 3x^2 - 4x^3) - (2 + 6x - 12x^2)(x^3 - x^2 - x - 1)}{(1 + 2x + 3x^2 - 4x^3)^2}$

$f'(0) = \frac{-1 \cdot 1 - 2 \cdot -1}{1^2} = 1$

4) $f(x) = \sqrt{3x} \cdot \ln x$, $x_0 = 1$

$f'(x) = \frac{12x}{6x} + \frac{\sqrt{3x}}{x}$

$f'(1) = \sqrt{3}$