Тема 6.

1) a) $(\sin x \cdot \cos x)' = \sin' x \cos x + \sin x \cos' x =$
$= \cos^2 x - \sin^2 x$

б) $\left(\left(\ln(2x+1)\right)^3\right)' = 3\left(\ln(2x+1)\right)^2 \cdot \frac{1}{2x+1} \cdot 2 =$
$= \frac{6\left(\ln(2x+1)\right)^2}{2x+1}$

c) $\sqrt{\sin^2(\ln(x^3))} = \frac{1}{2\sqrt{\sin^2(\ln(x^3))}} \cdot 2\sin(\ln(x^3)) \times$
$\times \cos(\ln(x^3)) \cdot \frac{1}{x^3} \cdot 3x^2 = \frac{6x^2 \sin(\ln(x^3))\cos(\ln(x^3))}{2x^3\sqrt{\sin^2(\ln(x^3))}} =$
$= \frac{3\sin(\ln(x^3))\cos(\ln(x^3))}{x\sqrt{\sin^2(\ln(x^3))}}$

d) $\left(\frac{x^4}{\ln(x)}\right)' = \frac{(x^4)'\ln x - (\ln x)' x^4}{(\ln(x))^2} = \frac{4x^3 \ln x - \frac{x^4}{x}}{(\ln x)^2} =$
$= \frac{4x^3 \ln x - x^3}{(\ln x)^2}$

2) $f(x) = \cos(x^2 + 3x)$, $x_0 = \sqrt{\pi}$
$f'(x) = -\sin(x^2 + 3x) \cdot (2x + 3)$
$f'(\sqrt{\pi}) = -\sin(\pi + 3\sqrt{\pi}) \cdot (2\sqrt{\pi} + 3) =$
$= (2\sqrt{\pi} + 3)\sin(3\sqrt{\pi}) \approx 6{,}545 \cdot -0{,}822 =$
$= -5{,}383$

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

$$f'(x) = \frac{(\ )'(\ ) - (\ )(\ )'}{(\ )^2} =$$

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

$$f'(0) = \frac{-1 \cdot 1 - (-1) \cdot 2}{1^2} = -3$$

Ответ: -3

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

$$f'(x) = (\ )' \ln x + (\ )(\ln x)' = \frac{\ln x}{2\sqrt{3x}} + \frac{\sqrt{3x}}{x}$$

$$f'(1) = \frac{0}{2\sqrt{3}} + \sqrt{3}/1 = \sqrt{3}$$

$$\alpha = \operatorname{arctg}(\sqrt{3}) = \frac{\pi}{3}$$

Ответ: $\pi/3$ радиан (60°)