1) a) $y = \dfrac{e^x}{\ln x}$ $y' = \dfrac{\ln x \, e^x - e^x \frac{1}{x}}{(\ln x)^2}$
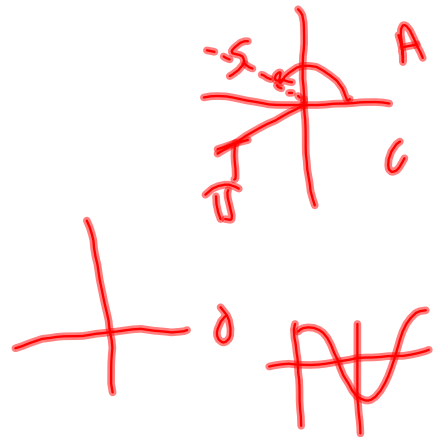
b) $y = \sin^2(\ln x)$ $y' = 2\sin(\ln x)\frac{1}{x}$

2) a) $\cos^{-1}(\cos 210)$

$\cos^{-1}(-\cos 30)$

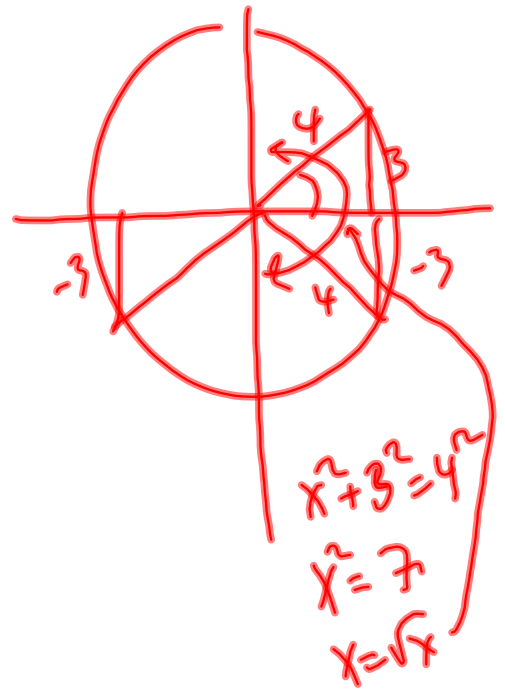$\cos^{-1}\left(-\dfrac{\sqrt{3}}{2}\right)$

$150°$, $\dfrac{5\pi}{6}$

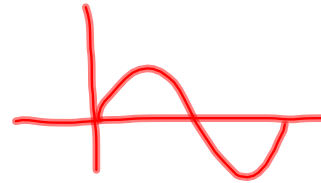2b) $\sec\left[\sin^{-1}\left(-\frac{3}{4}\right)\right]$

$\dfrac{4}{\sqrt{7}}$ $\dfrac{4\sqrt{7}}{7}$

$x^2 + 3^2 = 4^2$

$x^2 = 7$

$x = \sqrt{x}$

3) $\dfrac{d\left(\sin^{-1}(2x)\right)}{dx} = \dfrac{1}{\sqrt{1-(2x)^2}} \dfrac{d(2x)}{dx}$

$= \dfrac{2}{\sqrt{1-4x^2}}$

4a) $\displaystyle\lim_{x\to 0} \dfrac{\sin 2x}{\sin 5x} = \dfrac{0}{0}$

$\displaystyle\lim_{x\to 0} \dfrac{2\cos 2x}{5(\cos 5x)} = \dfrac{2}{5}$

4b) $\lim\limits_{x \to \infty} \dfrac{e^{3x}}{x^3} = \dfrac{\infty}{\infty}$ $\textcolor{red}{= \infty}$

① $\lim\limits_{x \to \infty} \dfrac{3e^{3x}}{3x^2} = \dfrac{\infty}{\infty}$

② $\lim\limits_{x \to \infty} \dfrac{9e^{3x}}{6x} = \dfrac{\infty}{\infty}$

③ $\lim\limits_{x \to \infty} \dfrac{27e^{3x}}{6} = \infty$