Задание 3

1) $y = (\sin(x) + \cos(x)) e^{(\sin(x) - \cos(x))}$

$y' = (\cos(x) - \sin(x)) e^{(\sin(x) - \cos(x))} + (\sin(x) + \cos(x)) \cdot e^{(\sin(x) - \cos(x))} \cdot (\cos(x) + \sin(x)) =$

$= \cos(x) \cdot e^{(\sin(x) - \cos(x))} - \sin(x) \cdot e^{(\sin(x) - \cos(x))} + e^{(\sin(x) - \cos(x))} + \sin(2x) e^{(\sin(x) - \cos(x))} =$

$= e^{(\sin(x) - \cos(x))} \cdot (\cos(x) - \sin(x) + 1 + \sin(2x))$

2) $y = \left(\frac{x - \sqrt{x}}{x + \sqrt{x}}\right)^2 =$

+

$y' = 2 \frac{x - \sqrt{x}}{x + \sqrt{x}} \cdot \frac{\left(1 - \frac{1}{2\sqrt{x}}\right)(x + \sqrt{x}) - (x - \sqrt{x})\left(1 + \frac{1}{2\sqrt{x}}\right)}{(x + \sqrt{x})^2} =$

$= 2 \frac{\cancel{\sqrt{x}}(\sqrt{x} - 1)}{x + \sqrt{x}} \cdot \frac{\frac{\cancel{2}x}{\cancel{2}\cancel{\sqrt{x}}}}{(x + \sqrt{x})^2} = \frac{2x(\sqrt{x} - 1)}{(x + \sqrt{x})(x + \sqrt{x})^2} =$

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

3) $y = \ln\left(\sqrt{1 + e^{2x} + e^{4x}}\right)$

$y' = \frac{1}{\sqrt{1 + e^{2x} + e^{4x}}} \cdot \frac{1}{2\sqrt{1 + e^{2x} + e^{4x}}} \cdot (e^{2x} \cdot 2 + e^{4x} \cdot 4) =$

$= \frac{1}{1 + e^{2x} + e^{4x}} \cdot (e^{2x} + 2e^{4x}) = \frac{e^{2x} + 2e^{4x}}{1 + e^{2x} + e^{4x}}$

4) $y = \operatorname{arctg}\left(\frac{x+1}{x-1}\right)$

$$y' = \frac{1}{1+\left(\frac{x+1}{x-1}\right)^2} \cdot \frac{(x-1)-(x+1)}{(x-1)^2} =$$

$$= \frac{1}{1+\frac{(x+1)^2}{(x-1)^2}} \cdot \frac{-2}{(x-1)^2} = \frac{\cancel{(x-1)^2}}{(x-1)^2+(x+1)^2} \cdot \frac{-2}{\cancel{(x-1)^2}} =$$

$$= -\frac{2}{(x-1)^2+(x+1)^2} = \frac{-2}{2x^2+2} = \frac{-1}{x^2+1}$$

5) $y = tg^3(6x)(e^{\frac{1}{x}}+1)$

$$y' = 3tg^2(6x)\cdot\left(\frac{1}{\cos(6x)}\right)^2 \cdot 6e^{\frac{1}{x}} + tg^3(6x)\cdot e^{\frac{1}{x}} \cdot \left(\frac{-1}{x^2}\right) =$$

$$= 3\left(\frac{\sin(6x)}{\cos(6x)}\right)^2 \cdot \left(\frac{1}{\cos(6x)}\right)^2 \cdot 6e^{\frac{1}{x}} - \frac{\sin^3(6x)}{\cos^3(6x)} \cdot e^{\frac{1}{x}} \frac{1}{x^2} =$$

$$= \frac{18e^{\frac{1}{x}}\cdot\sin^2(6x)}{\cos^4(6x)} - \frac{\sin^3(6x)\cdot e^{\frac{1}{x}}}{\cos^3(6x)\cdot x^2}$$

6) ~~$y = \arcsin(\sin^2(x)) + \sqrt[3]{1-x}$~~

$y = \arcsin(\sin^2(x)) + \sqrt[3]{1-x}$.

$$y' = \frac{1}{\sqrt{1-(\sin^2(x))^2}} \cdot 2\sin(x)\cdot\cos(x) + \frac{1}{3}\cdot(1-x)^{-\frac{2}{3}}\cdot(-1) =$$

$$= \frac{1}{\sqrt{1-\sin^4(x)}} \cdot \sin(2x) - \frac{1}{3} \cdot \frac{1}{(1-x)^{\frac{2}{3}}} =$$

+

$$= \frac{\sin(2x)}{\sqrt{1-\sin^4(x)}} - \frac{1}{3(1-x)^{\frac{2}{3}}} =$$

$$= \frac{\sin(2x)}{\sqrt{1-\sin^4(x)}} - \frac{1}{3\sqrt[3]{(1-x)^2}}$$

7) $\begin{cases} x = 2(t^3+t) \\ y = e^{t^2} \end{cases}$

$x' = 6t^2+2$

$y' = 2e^{t^2} \cdot t$

+

$$\frac{dy}{dx} = \frac{2e^{t^2}t}{6t^2+2} = \frac{te^{t^2}}{3t^2+1}$$