1. $y=\frac{1}{x}+\frac{2}{x^2}-\frac{5}{x^3}+\sqrt{x}-\sqrt[3]{x}+\frac{3}{\sqrt{x}}=$

$=x^{-1}+2x^{-2}-5x^{-3}+x^{\frac{1}{2}}-x^{\frac{1}{3}}+3x^{-\frac{1}{2}}$

$y'=-x^{-2}-4x^{-3}+15x^{-4}+\frac{1}{2}x^{-\frac{1}{2}}-\frac{1}{3}x^{-\frac{2}{3}}-1{,}5x^{-\frac{3}{2}}$

2. $y=x\sqrt{1+x^2}$

$y'=\sqrt{1+x^2}+\frac{x\cdot 2x}{2\sqrt{1+x^2}}=\sqrt{1+x^2}+\frac{x^2}{\sqrt{1+x^2}}=\frac{1+x^2+x^2}{\sqrt{1+x^2}}=\frac{1+2x^2}{\sqrt{1+x^2}}$

3. $y=\frac{2x}{1-x^2}$

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

5. $y=\ln(x+\sqrt{x^2+1})$

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

6. $y=x\cdot\ln(x+\sqrt{x^2+1})-\sqrt{x^2+1}$

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

$\cancel{=\ln(x+\sqrt{x^2+1})}$

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

7*. $y = \arcsin(\sin x)$

$$y' = \frac{\cos x}{\sqrt{1-\sin^2 x}} = \operatorname{sign}(\cos x)$$

4*. $y = \sqrt{x + \sqrt{x + \sqrt{x}}}$

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