1.

$$y = \sin^3\left(\frac{2}{x}\right)^5$$

$$y' = 3\sin^2\left(\frac{2}{x}\right)^5 \cdot \cos\left(\frac{2}{x}\right)^5 \cdot 5\left(\frac{2}{x}\right)^4 \cdot \frac{-2}{x^2} = \boxed{\frac{-30}{x^6}\sin^2\left(\frac{2}{x}\right)^5 \cdot \cos\left(\frac{2}{x}\right)^5}$$

2.

$$y = tg^{2x}(3x)$$

Vamos a utilizar la derivada logarítmica:

1º) Tomamos logaritmos: $\ln y = \ln tg^{2x}(3x) = 2x \ln tg(3x)$

2º) derivamos: $\frac{y'}{y} = 2\ln tg(3x) + 2x \frac{1}{tg(3x)} \cdot sec^2(3x) \cdot 3 = 2\ln tg(3x) + \frac{6x}{\sin(3x)\cos(3x)}$

3º) despejamos y': $\boxed{y' = \left(2\ln tg(3x) + \frac{6x}{\sin(3x)\cos(3x)}\right) tg^{2x}(3x)}$

3.

$$y = \log_{10}\sqrt[3]{1-2x}$$

$$y' = \frac{1}{\sqrt[3]{1-2x}} \cdot \frac{1}{\ln 10} \cdot \frac{1}{3\sqrt[3]{(1-2x)^2}} \cdot (-2) = \boxed{\frac{-2}{3\ln 10 \cdot (1-2x)}}$$

También se podría haber hecho aplicando previamente las propiedades de la función logarítmica.

$$y = \log_{10}\sqrt[3]{1-2x} = \frac{1}{3}\log_{10}(1-2x)$$

$$y' = \frac{1}{3} \frac{1}{1-2x} \cdot \frac{1}{\ln 10} \cdot (-2) = \boxed{\frac{-2}{3\ln 10\,(1-2x)}}$$

4.

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

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

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

También se puede utilizar la derivada logarítmica

$$\ln y = \ln(1-x) - \ln(1+x) - \ln e^{2x} = \ln(1-x) - \ln(1+x) - 2x$$

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

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

(5) $y = \dfrac{\sqrt{3x}}{(3x-1)^2}$

$$y' = \frac{\frac{1}{2\sqrt{3x}}\cdot 3\cdot(3x-1)^2 - \sqrt{3x}\cdot 2\cancel{(3x-1)}\cdot 3}{(3x-1)^{\cancel{4}\,3}} = \frac{\frac{3(3x-1)}{2\sqrt{3x}} - 6\sqrt{3x}}{(3x-1)^4} =$$

$$= \frac{\frac{9x-3-12\cdot 3x}{2\sqrt{3x}}}{(3x-1)^4} = \boxed{\frac{6x-15}{2(3x-1)^4\sqrt{3x}}}$$

(6) $y = \arcsin\sqrt{\dfrac{x+1}{x-1}}$

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

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

(7) $y = \dfrac{x^2-x}{(2x-1)^2}$

$$y' = \frac{\cancel{(2x-1)}(2x-1)^2 - (x^2-x)\cdot 2\cancel{(2x-1)}\cdot 2}{(2x-1)^{\cancel{4}\,3}} = \frac{(2x-1)^2 - 4(x^2-x)}{(2x-1)^3} = \frac{4x^2-4x+1-4x^2+4x}{(2x-1)^3} = \boxed{\frac{1}{(2x-1)^3}}$$

$$y'' = \frac{-1\cdot 3(2x-1)^{\cancel{2}}\cdot 2}{(2x-1)^{\cancel{6}\,4}} = \boxed{\frac{-6}{(2x-1)^4}}$$