A)

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

$$(\sin x \cos x)' = \cos 2x$$

B)

$$\left(A^{\tan^2(2x+1)}\right)' = A^{\tan^2(2x+1)}(\ln A)\left(2\tan(2x+1)\frac{1}{\cos^2(2x+1)}\cdot 2\right) =$$

$$= A^{\tan^2(2x+1)}(\ln A)\left(\frac{4\dfrac{\sin(2x+1)}{\cos(2x+1)}}{\cos^2(2x+1)}\right) = A^{\tan^2(2x+1)}(\ln A)\frac{4\sin(2x+1)}{\cos^3(2x+1)}$$

$$\left(A^{\tan^2(2x+1)}\right)' = A^{\tan^2(2x+1)}(\ln A)\frac{4\sin(2x+1)}{\cos^3(2x+1)}$$

C)

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

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

D)

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

$$\left| \begin{array}{l} a = \dfrac{x}{2}\sqrt{1-x^2} \\ b = \dfrac{1}{2}\arcsin x \end{array} \right|$$

$$= a' + b' =$$

$$\left| \begin{array}{l} a' = \dfrac{1}{2}\sqrt{1-x^2} - \dfrac{x^2}{2\sqrt{1-x^2}} \\ b' = \dfrac{1}{x\sqrt{1-x^2}} \end{array} \right|$$

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

E)

$$\left(\frac{3-x}{2}\sqrt{1-2x-x^2}+2\arcsin\left(\frac{1+x}{\sqrt{2}}\right)\right)'=$$

$$\check{C}\acute{a}st1.=\frac{1}{2}\left((3-x)\sqrt{-x^2-2x+1}\right)'=\frac{1}{2}\left((-1)\sqrt{-x^2-2x+1}\right)+\frac{1}{2}(3-x)\left(-x^2-2x+1\right)^{-\frac{1}{2}}=$$

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

$$\check{C}\acute{a}st2.=2\left(\arcsin\frac{1+x}{\sqrt{2}}\right)'=2\left(\frac{1}{\sqrt{1-\left(\frac{1+x}{\sqrt{2}}\right)^2}}\frac{1}{\sqrt{2}}\right)=2\left(\frac{1}{\sqrt{\frac{2-\left(x^2+2x+1\right)}{2}}}\frac{1}{\sqrt{2}}\right)=2\frac{1}{\sqrt{-x^2-2x+1}}$$

$$\check{C}\acute{a}sti1+2=\frac{x^2-2}{\sqrt{-x^2-2x+1}}+\frac{2}{\sqrt{-x^2-2x+1}}=\frac{x^2}{\sqrt{-x^2-2x+1}}$$

$$\left(\frac{3-x}{2}\sqrt{1-2x-x^2}+2\arcsin\frac{1+x}{\sqrt{2}}\right)'=\frac{x^2}{\sqrt{-x^2-2x+1}}$$

F)

$$\left(\frac{1}{12}\ln\frac{x^4-x^2+1}{\left(x^2+1\right)^2}-\frac{1}{2\sqrt{3}}\arctan\frac{\sqrt{3}}{2x^2-1}\right)'=$$

$$=\frac{1}{12}\left(\ln\frac{x^4-x^2+1}{\left(x^2+1\right)^2}\right)'-\frac{1}{2\sqrt{3}}\left(\arctan\frac{\sqrt{3}}{2x^2-1}\right)'$$

$$\check{C}\acute{a}st1.=\frac{1}{12}\left(\frac{\left(x^2+1\right)^2}{x^4-x^2+1}\frac{\left(4x^3-2x\right)\left(x^2+1\right)^2-\left(x^4-x^2+1\right)\left(4x\left(x^2+1\right)\right)}{\left(x^2+1\right)^4}\right)=$$

$$=\frac{1}{12}\left(\frac{6\left(x^5-x\right)}{\left(x^4-x^2+1\right)\left(x^2+1\right)^2}\right)=\frac{x^5-x}{2\left(x^4-x^2+1\right)\left(x^2+1\right)^2}$$

$$\check{C}\acute{a}st2.=\frac{1}{2\sqrt{3}}\left(\frac{1}{1+\left(\frac{\sqrt{3}}{2x^2-1}\right)^2}\frac{-4\sqrt{3}}{\left(2x^2-1\right)^2}\right)=\frac{1}{2\sqrt{3}}\left(\frac{2\sqrt{3}(-2x)}{\left(2x^2-1\right)^2+3}\right)=\frac{-2x}{\left(2x^2-1\right)^2+3}$$

$$\check{C}\acute{a}sti1+2.=\frac{x^5-x}{2\left(x^4-x^2+1\right)\left(x^2+1\right)^2}-\frac{-2x}{\left(2x^2-1\right)^2+3}=\frac{x^5-x}{2\left(x^4-x^2+1\right)\left(x^2+1\right)^2}+\frac{x}{2x^4-2x^2+2}=$$

$$=\frac{2x^9-2x^7+2x^5-2x^5+2x^3-2x+2x^9+2x^7+2x^3+2x}{4\left(x^4-x^2+1\right)\left(x^8+x^6+x^2+1\right)}=\frac{x^3\left(x^6+1\right)}{x^{12}+2x^6+1}=\frac{x^3\left(x^6+1\right)}{\left(x^6+1\right)^2}=\frac{x^3}{x^6+1}$$

$$\left(\frac{1}{12}\ln\frac{x^4 - x^2 + 1}{\left(x^2+1\right)^2} - \frac{1}{2\sqrt{3}}\arctan\frac{\sqrt{3}}{2x^2-1}\right)' = \frac{x^3}{x^6+1}$$

G)

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

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

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

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

H)

$$\left(\frac{1}{6}\ln\frac{(x+1)^2}{x^2-x+1} + \frac{1}{\sqrt{3}}\arctan\frac{2x-1}{\sqrt{3}}\right)' =$$

$$= \frac{1}{6}\cdot\frac{\left(x^2-x+1\right)}{(x+1)^2}\cdot\frac{(2x+2)\left(x^2-x+1\right)-\left(x^2+2x+1\right)(2x-1)}{\left(x^2-x+1\right)^2} + \frac{1}{\sqrt{3}}\cdot\frac{1}{1+\left(\frac{2x-1}{\sqrt{3}}\right)^2}\cdot\frac{1}{\sqrt{3}}\cdot 2 =$$

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

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

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

$$= \left[\left(x^2-x+1\right)(x+1)\right]^{-1}$$

$$\left(\frac{1}{6}\ln\frac{(x+1)^2}{x^2-x+1} + \frac{1}{\sqrt{3}}\arctan\frac{2x-1}{\sqrt{3}}\right)' = \left[\left(x^2-x+1\right)(x+1)\right]^{-1}$$