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Prove that the derivative of $f(x) = \cot^{-1} x$ is $f'(x) = -\dfrac{1}{1+x^2}$ using a proof similar to the ones for the derivatives of $\sin^{-1} x$ and $\tan^{-1} x$.

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Find the equation of the tangent line to the curve $x^2y^4 - y^3 = 1 + xy^2$ at $(-1, 1)$.

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Find the equation of the tangent line to the curve $x^3y^4 - y^2 = 1 - xy^2$ at $(1, -1)$.

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Find and simplify the derivatives of the following.

[a] $f(x) = \dfrac{\sin^{-1}\sqrt{x}}{\sqrt{x}}$

[b] $f(x) = \ln\sqrt{\sec x - \tan x}$

[c] $f(x) = \dfrac{1}{\sqrt{\tan^{-1} x}}$

[d] $f(x) = (\sec x)(\ln\cos x)$

[e] $\sqrt{x^2 - y^3} + y^2 = x$

[f] $\sqrt{x^3 - y^2} - y^3 = x$

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