#1. Use the 5-step method to find $\frac{\partial}{\partial x} f$, given that $f(x) = \sqrt{1 - x^2}$.

#2. Use the 5-step method to find $\frac{\partial}{\partial x} f$, given that $f(x) = x^3 - 3x + 1$.

#3. Use the Rules of Derivatives (Differentiation Formulas) to find the derivative of $y = \frac{\sqrt{x} - 1}{\sqrt{x} + 1}$.

#4. Differentiate $f(t) = \frac{\sec(t)}{1 + \tan(t)}$. (Use Rules & Formulas).

#5. Find the equation in standard form for the tangent line to the "Bullet-nose Curve," $f(x) = \frac{|x|}{\sqrt{2 - x^2}}$ at the point $P(1, 1)$.

Hint: When $0 < x$, then $|x| = x$.

#6. Given the "Folium of Descartes," $x^3 + y^3 = 6xy$, use implicit


differentiation to find \( \frac{\partial}{\partial x} y \).

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#7. Find \( \frac{\partial^2}{\partial x^2} f \) if \( f(x) = \frac{2x + 1}{x - 1} \).

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#8. (a) Find the differential \( dy \) and

(b) evaluate \( dy \) for the given values of \( x \) and \( dx \).

\[ y = \frac{1}{x + 1}, \quad x = 1, \quad dx = -0.01. \]

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#9. Find the derivative of \( y = \cos(\sqrt{x^2 + 2}) \).

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#10. Find a second degree polynomial \( P \) such that \( P(1) = 4 \),

\( P'(1) = 7 \), and \( P''(1) = 4 \).

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**BONUS:** A water trough with vertical cross section in the shape of an equilateral triangle is being filled at a rate of 4 cubic feet per minute. If the trough is 15 feet long, how fast is the level of the water rising at the instant the water reaches a depth of \( 1 \frac{1}{2} \) feet?