Normal Lines

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A normal line to a curve at a point is the line perpendicular to the tangent at that point.

The slope of a normal line is the opposite, reciprocal slope of the tangent line.

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1. Find the equation of the line normal to $h(x) = \frac{3}{x^2}$ at $x = -4$.

2. Find the slope of the line normal to the graph of $f(x) = 4\sqrt{x} - 2x$ at (9, -6).

3. If it exists, determine the equation of the line normal to the following function at the breakpoint.

$$g(x) := \begin{cases} x^2 + 3 & x < 1 \\ 2x + 2 & x \geq 1 \end{cases}$$

4. Suppose p and q are differentiable functions with the values in the table below. Find the equation of the line normal to $r(x)$ at $x = -2$ provided $r(x) = p(x) - 3q(x)$.

x	$p(x)$	$q(x)$	$p'(x)$	$q'(x)$
-2	5	7	-1	6

Class Notes for Tangent & Normal Lines

1. Let $f(x)$ be defined as $f(x) = 1 + 2x - x^3$. Find the equation of the line normal to $f(x)$ at the point where $x = 2$.

2. Determine the point on the graph of $y = x^2 - 3x$ where the tangent line is parallel to the line $-x + y = 11$.

3. Consider that $f(x)$ and $g(x)$ are differentiable functions. Using the table below, find the slope of the line normal to $h(x)$ at $x = -1$, if $h(x) = f(x) - 4(g(x))$.

x	-1	2	3
$f(x)$	0.3	2	-3
$f'(x)$	0.5	-1	0
$g(x)$	4	2	-0.2
$g'(x)$	-1	5	0.7

(calc.) 4. Find the equation of the line tangent to the graph of $g(x) = -(x^4) + 2x^3 - x$ at the point where $g'(x) = 3$.