

Challenge problems

1. Find an equation of the line that is tangent to $f(x) = \frac{1}{\sqrt{x}}$ and parallel to the line $x + 2y - 6 = 0$.
2. Draw a function with the following characteristics:
 - a. $f(0) = 2$; $f'(x) = -3$, $-\infty < x < \infty$.
 - b. $f(0) = 4$; $f'(0) = 0$; $f'(x) < 0$ for $x < 0$; $f'(x) > 0$ for $x > 0$.
 - c. $f(0) = 0$; $f'(0) = 0$; $f''(x) < 0$.
3. Find the equation of the tangent line to the graph of $f(x) = \sqrt{x}$ that passes through the point $(-4, 0)$ (not on the graph of the function).
4. Find the equation of the two tangent lines to the graph of $f(x) = -x^2$ that pass through the point $(0, 2)$ (not on the graph of the function).
5. Find k so that the line $y = x + 4$ is tangent to the graph of the function $f(x) = k\sqrt{x}$.