Use the quotient rule to find the derivative, $f'(x)$.

Recall, for $\frac{f(x)}{g(x)}$, the quotient rule is
\[
\frac{d}{dx} \left[ \frac{f(x)}{g(x)} \right] = \frac{g(x) \cdot f'(x) - f(x) \cdot g'(x)}{(g(x))^2}
\]

1. \[
\frac{d}{dx} \left[ \frac{x + 4}{x^2 - 2} \right]
\]

\[
f(x) = x + 4 \quad g(x) = x^2 - 2 \\
f'(x) = 1 \quad g'(x) = 2x
\]

\[
\frac{d}{dx} \left[ \frac{x + 4}{x^2 - 2} \right] = \frac{(x^2 - 2) \cdot (1) - (x + 4) \cdot (2x)}{(x^2 - 2)^2}
\]
\[
= \frac{x^2 - 2 - (2x^2 + 8x)}{(x^2 - 2)^2}
\]
\[
= \frac{x^2 - 2 - 2x^2 - 8x}{(x^2 - 2)^2}
\]
\[
= \frac{-x^2 - 8x - 2}{(x^2 - 2)^2}
\]

You should get in the habit of simplifying now. You’ll have to do it a lot when we get to sketching curves using derivatives.

2. \[
\frac{d}{dx} \left[ \frac{\sin(x) - \cos(x)}{\frac{1}{x} - 6} \right]
\]

Make sure every term in the function is in the correct form. For example, we should rewrite
\[
\frac{1}{x} = x^{-1}
\]
\[
f(x) = \sin(x) - \cos(x) \quad g(x) = x^{-1} - 6 \\
f'(x) = \cos(x) + \sin(x) \quad g'(x) = -1x^{-2}
\]
\[
\frac{d}{dx} \left[ \frac{\sin(x) - \cos(x)}{\frac{1}{x} - 6} \right] = \frac{(x^{-1} - 6) \cdot (\cos(x) + \sin(x)) - (\sin(x) - \cos(x)) \cdot (-1x^{-2})}{(x^{-1} - 6)^2}
\]

You can attempt to distribute this stuff out, but it probably won’t do much good. These types of functions are good to differentiate if that’s all you’re doing. But if you have to set the derivative equal to 0, then the function will be more like the first example.