1. Let’s re-draw the graph of $f'(x)$:

\[ f'(x) \text{ is ccw when } f''(x) > 0. f''(x) \text{ is just the derivative of } f'(x), \text{ so we just need to find where } f'(x) \text{ is increasing. Looking at the graph, we can see that this occurs on about } (0.9) \text{ and } (3.2, 5). \]

2. \[
\frac{d}{dt} \left( \frac{1}{t^{\frac{1}{3}}} + \frac{t^3}{3} - \pi t e \right) = \frac{d}{dt} \left( t^{-\frac{1}{3}} \right) + \frac{d}{dt} \left( \frac{t^3}{3} \right) - \frac{d}{dt} \left( \pi t e \right)
\]

\[
= -\frac{1}{3} t^{-\frac{4}{3}} + \frac{3t^2}{3} - \pi e t e^{-1}
\]

\[
= -\frac{t^{-\frac{4}{3}}}{3} + t^2 - \pi e t e^{-1}
\]
3. Here are two examples:

(i) \( f(x) = |x| \)

\[
\begin{align*}
\lim_{h \to 0^+} \frac{f(0+h) - f(0)}{h} &= \lim_{h \to 0^+} \frac{|h|}{h} \\
\lim_{h \to 0^-} \frac{f(0+h) - f(0)}{h} &= \lim_{h \to 0^-} \frac{|h|}{h}
\end{align*}
\]

\( |h| \) is always positive, and \( h \to 0^+ \), so \( h \) is positive, so this limit is 1. Now take the left-hand limit:

\[
\lim_{h \to 0^-} \frac{f(0+h) - f(0)}{h} = \lim_{h \to 0^-} \frac{|h|}{h}
\]

\( |h| \) is positive, but \( h \to 0^- \), so \( h \) is negative, so \( \frac{|h|}{h} = -1 \), so this limit is \(-1\). Because the one-sided limits are different, the limit itself doesn't exist, which means \( f(x) \) isn't differentiable at \( x=0 \).
(ii) \( f(x) = \begin{cases} 1 & x \neq 0 \\ 0 & x = 0 \end{cases} \)

This function isn't continuous at \( x = 0 \), so it's automatically not differentiable, but let's check this using the definition:

\[
\lim_{h \to 0} \frac{f(0+h) - f(0)}{h} = \lim_{h \to 0} \frac{f(h)}{h} = \lim_{h \to 0} \frac{1}{h} = \infty
\]

The limit does not exist, so \( f(x) \) isn't differentiable at \( x = 0 \).