Things you should know:
\( f(x) \) increasing \( \iff \) ___________
\( f(x) \) decreasing \( \iff \) ___________

\( f(x) \) concave up \( \iff \) ___________ \( \iff \) ___________
\( f(x) \) concave down \( \iff \) ___________ \( \iff \) ___________

1. Here is the graph of \( f''(x) \). The domain is given and it is all real numbers. Where is \( f(x) \) concave up? concave down? What are the inflection values of \( f(x) \).

2. Find the asymptotes for these functions.
   (a) \( y = \frac{x^2 - 6x + 8}{3x^2 - 48} \)
   (b) \( y = \ln(x^2 - 25) \)
   (c) \( y = 3 + e^{-x^2} \)

3. Find the intervals where the function is concave up and concave down, increasing and decreasing. Find anything else that might be useful to graph the function.
   \( f(x) = \frac{3x + 4}{(x + 5)^2} \)
   \( f'(x) = \frac{-3x + 7}{(x + 5)^3} \)
   \( f''(x) = \frac{6(x - 6)}{(x + 5)^4} \)

4. Sketch a graph of \( f(x) \) using the supplied information.
   (a) Assume that the function is defined and continuous for all real \( x \).
   \[
   \begin{array}{c|c|c|c}
   y' & y' = 0 & y' = 0 & y' < 0 \\
   x_1 & x_2 & x_3 \\
   y'' & y'' = 0 & y'' < 0 & y'' > 0
   \end{array}
   \]
(b) x-intercept of 0, vertical asymptote: $x = -5$ and $x = 5$

$f''(-2) = f'(2) = f'(7) = 0$, $\lim_{x \to \infty} f(x) = 0$, $\lim_{x \to -\infty} f(x) = 3$

$f'(x) < 0$ on $(-\infty, -5), (-5, -2)$ and $(2, 5)$

$f'(x) > 0$ on $(-2, 2)$ and $(5, \infty)$

$f''(x) > 0$ on $(-5, 0)$ and $(7, 9)$

$f''(x) < 0$ on $(-\infty, -5), (0, 5), (5, 7)$ and $(9, \infty)$