Problem 1. *Sketch the graph of a function that satisfies all of the conditions.*

(a) *Vertical asymptote* $x = 0$,
$f'(x) > 0$ *if* $x < -2$, $f'(x) < 0$ *if* $x > -2$ $(x \neq 0)$,
$f''(x) < 0$ *if* $x < 0$, $f''(x) > 0$ *if* $x > 0$.

(b) $f'(0) = f'(2) = f'(4) = 0$
$f'(x) > 0$ *if* $x < 0$ *or* $2 < x < 4$,
$f'(x) < 0$ *if* $0 < x < 2$ *or* $x > 4$,
$f''(x) > 0$ *if* $1 < x < 3$, $f''(x) < 0$ *if* $x < 1$ *or* $x > 3$.

Problem 2. *Consider* $f(x) = (x+1)^5 - 5x - 2$.

(a) Find the intervals of increase and decrease.

(b) Find the local maximum and minimum values.

(c) Find the intervals of concavity and the inflection points.

(d) Use this information to sketch the graph of f.

Problem 3. *Use the method in Problem 2 to graph* $f(x) = \ln(x^4 + 27)$.