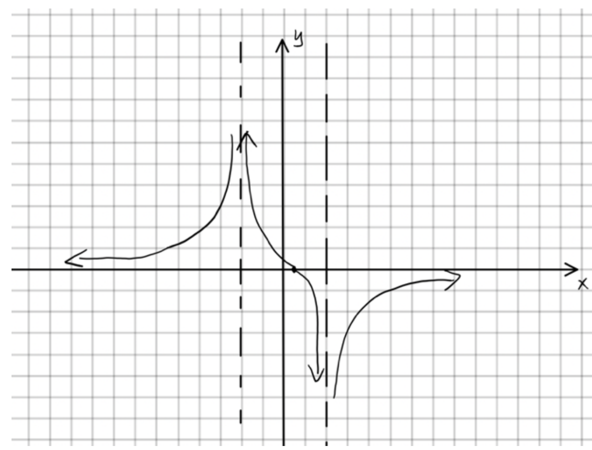
In class practice: Curve Sketching

1. (K, 3 marks) Use second derivative test to find the local maximum of minimum points.
   $f(x) = x^3 + 3x^2 - 2$

2. The following graph represents the derivative function $f'(x)$ of a function $f(x)$.
   Note: The vertical asymptote if x = - 2 and x = 2.



   - Find the interval of increase/decrease of the function *f(x).*
   - On which intervals is the graph of the function f(x) concave up, and on which interval is the graph concave down?

3. Sketch a possible graph for a function that has the following characteristics. Explain your solution by marking important features on your graph. Only graph will be marked.

   - $x \neq 1, 3$
   - $f(2) = f(-2) = 2$
   - $f(-1) = -2$
   - $\lim_{x \to -\infty} f(x) = 4$
   - $\lim_{x \to \infty} f(x) = 2$
   - $\lim_{x \to 1^-} f(x) = \infty$
   - $\lim_{x \to 1^+} f(x) = \infty$
   - $\lim_{x \to 3^-} f(x) = -\infty$
   - $\lim_{x \to 3^+} f(x) = -\infty$
   - $\mathrm{f}'(-1) = \mathrm{f}'(2) = 0$
   - $f'(x) < 0 \; on \; (-\infty, -1) \cup (1,3)$
   - $f'(x) > 0 \; on \; (-1, 1) \cup (3, \infty)$
   - $f''(x) < 0 \text{ on } (-\infty, -2) \cup (2, 3) \cup (3, \infty)$
   - $f''(x) > 0 \text{ on } (-2,1) \cup (1, 2)$

4. Sandy is making a closed rectangular jewellery box with a square base from two different woods. The wood for the top and bottom costs \$20/m^2. The word for the sides costs \$30/m^2. Find the dimensions that will minimize the cost of the word for a volume of 4000 cm^3.

5. Determine the values of m and n so that the polynomial function: $y = 2x^3 + mx^2 + nx - 10$ has a local maximum when $x = -2$ and a local minimum when $x = 3$.