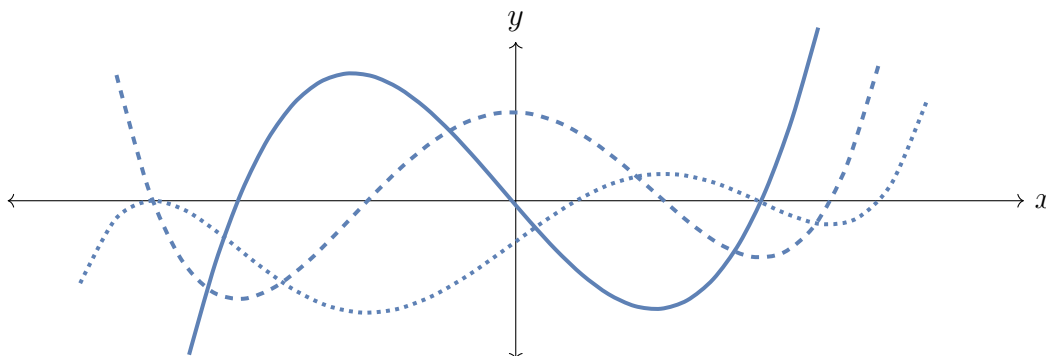


1. **Warm up:** The following figure shows the graphs of f , f' , and f'' . Which curve is which? Justify your answers.



2. For each of the following functions, find the critical points, inflection points, and local extrema. Indicate the concavity of each function and where it changes.

$$f(x) = x^4 - 8x^3 + 18x^2$$

$$g(x) = \sin(x) + x^2$$

$$h(x) = \frac{1}{x^2 - 4x + 3}$$

3. For each of the functions below, identify all horizontal, vertical, and slant asymptotes.

(a) $f(x) = \frac{3x - 4}{4x - 3}$

(d) $k(x) = \frac{9x^2 + 3x - 7}{x - \frac{1}{2}}$

(b) $g(x) = \frac{x^2 - 18 + 7x}{x - 2}$

(e) $\ell(x) = \begin{cases} \frac{4x+2}{9x+1} & x < 0 \\ \frac{2x}{7x+6} & x \geq 0 \end{cases}$

(c) $h(x) = \frac{\arctan(x)}{(x + \pi)^2}$

4. Sketch the graph of the function $f(x) = \frac{3x^2 + 2x - 1}{x^2 - x - 1}$, taking care to label all x - and y -intercepts and all asymptotes.