

Exercise 1 Consider a function $f(x) = \frac{x}{x^2+1}$.

- (a) Find the intervals on which f is increasing or decreasing.
- (b) Find the local maximum and minimum values of f .
- (c) Find the intervals of concavity and the inflection points.

Exercise 2 Consider a function $g(x) = x^4e^{-x}$.

- (a) Find the intervals on which g is increasing or decreasing.
- (b) Find the local maximum and minimum values of g .
- (c) Find the intervals of concavity and the inflection points.

Exercise 3 Sketch the graph of a function that satisfies the following conditions: (i) vertical asymptote $x = 0$; (ii) $f'(x) > 0$ if $x < -2$; (iii) $f'(x) < 0$ if $x > -2$ ($x \neq 0$); (iv) $f''(x) < 0$ if $x < 0$; (v) $f''(x) > 0$ if $x > 0$.

Exercise 4 Consider a function $h(x) = 5x^{2/3} - 2x^{5/3}$.

- (a) Find the intervals on which h is increasing or decreasing.
- (b) Find the local maximum and minimum values of h .
- (c) Find the intervals of concavity and the inflection points.
- (d) Use the information from parts (a)-(c) to sketch the graph.