

Find all relative extrema of the following functions. You may use the first or second derivative test (when applicable).

1.  $f(x) = -x^3 + 3x^2 - 2$

2.  $f(x) = 6x - x^2$

3.  $f(x) = (x - 5)^2$

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

5.  $f(x) = x^4 - 4x^3 + 2$

6.  $f(x) = x^{\frac{2}{3}} - 3$

7.  $f(x) = x + \frac{4}{x}$

8.  $f(x) = x^3 - 12x$

9.  $f(x) = x^3 - 6x^2 + 12x - 8$

10.  $f(x) = \frac{1}{4}x^4 - 2x^2$

11.  $f(x) = (x - 1)(x + 2)^2$

12.  $f(x) = x\sqrt{x+1}$

13.  $f(x) = \frac{4}{1+x^2}$

14.  $f(x) = \frac{24}{x^2+12}$

15.  $f(x) = \frac{x^2-1}{2x+1}$

16.  $f(x) = \frac{x^2+1}{x^2-1}$

## ANSWERS

1. Rel. min. at  $(0, -2)$ , Rel. max. at  $(2, 2)$ 2. Rel. max. at  $(3, 9)$ 3. Rel. min. at  $(5, 0)$ 4. Rel. max. at  $(0, 3)$ , Rel. min. at  $(2, -1)$ 5. Rel. min. at  $(3, -25)$ 6. Rel. min. at  $(0, -3)$ 7. Rel. max. at  $(-2, -4)$ , Rel. min. at  $(2, 4)$ 8. Rel. max. at  $(-2, 16)$ , Rel. min. at  $(2, -16)$ 

9. No relative extrema

10. Rel. max. at  $(0, 0)$ , Rel. min. at  $(-2, -4)$  and  $(2, -4)$ 11. Rel. max. at  $(-2, 0)$ , Rel. min. at  $(0, -4)$ 12. Rel. min. at  $(-2, -2)$ 13. Rel. max. at  $(0, 4)$ 14. Rel. max. at  $(0, 2)$ 

15. No relative extrema

16. Rel. max. at  $(0, -1)$