

> Problems 12.1: The First Derivative Test for Local Extrema

Use the first derivative test to determine a) where $f(x)$ is increasing and where it is decreasing and b) the location of the local extrema of the function.

Label all critical numbers and complete a sign diagram. Show your work for full credit.

1. $f(x) = 2x^2 + 3x + 7$

2. $f(x) = \frac{1}{3}x^3 - 2x^2 - 5x - 10$

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

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

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

6. $f(x) = x^{5/3}$

7. $f(x) = x^{2/3} + 2$

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

9. $f(x) = -x^3 - 3x^2 + 45x - 5$

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

11. $f(x) = \frac{x+1}{x}$

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

13. $f(x) = x + \frac{9}{x} + 2$

14. $f(x) = 2x^2 + \frac{4000}{x} + 10$

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

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

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

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

19. $f(x) = \frac{2x+1}{5-3x}$

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

21. $f(x) = (x-1)^{2/3}$

22. $f(x) = x\sqrt[3]{x-4}$

23. $f(x) = e^x - 4x$

24. $f(x) = e^{-x^2/2}$

25. $f(x) = x^2 e^{-x}$

26. $f(x) = \frac{e^x - e^{-x}}{2}$

27. $f(x) = \frac{e^x + e^{-x}}{2}$

28. $f(x) = \ln x^2$

29. $f(x) = \frac{\ln|x|}{x}$

30. $f(x) = x^2 + \ln x^2$

Need Help? First Derivative Test procedure is similar to the procedure used to solve Polynomial and Rational Inequalities, Section 2.5. Recall Properties of exponents and logarithms from Sections 4.3 and solving exponential and logarithmic equations from Section 4.4.