

The deadline for all homework assignments is the one specified in Archie before 11:59 pm. As discussed in class, It must be correctly uploaded in order to be graded. Show all your work and justifications.

There are 2 pages in this assignment:

In Exercises 9–18, determine the open intervals on which the graph is concave upward or concave downward.

9. $f(x) = -x^3 + 6x^2 - 9x - 1$

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

10. $f(x) = x^5 + 5x^4 - 40x^2$

14. $y = \frac{-3x^5 + 40x^3 + 135x}{270}$

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

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

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

18. $y = x + \frac{2}{\sin x}, \quad (-\pi, \pi)$

15. $g(x) = \frac{x^2 + 4}{4 - x^2}$

17. $y = 2x - \tan x, \quad \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

In Exercises 23–36, find the points of inflection and discuss the concavity of the graph of the function.

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

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

25. $f(x) = x(x - 4)^3$

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

27. $f(x) = x\sqrt{x + 3}$

28. $f(x) = x\sqrt{9 - x}$

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

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

31. $f(x) = \sin \frac{x}{2}, \quad [0, 4\pi]$

32. $f(x) = 2 \csc \frac{3x}{2}, \quad (0, 2\pi)$

33. $f(x) = \sec\left(x - \frac{\pi}{2}\right), \quad (0, 4\pi)$

35. $f(x) = 2 \sin x + \sin 2x, \quad [0, 2\pi]$

34. $f(x) = \sin x + \cos x, \quad [0, 2\pi]$

36. $f(x) = x + 2 \cos x, \quad [0, 2\pi]$

In Exercises 43–52, find all relative extrema. Use the Second Derivative Test where applicable.

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

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

45. $g(x) = x^2(6 - x)^3$

46. $g(x) = -\frac{1}{8}(x + 2)^2(x - 4)^2$

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

48. $f(x) = \sqrt{x^2 + 1}$

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

50. $f(x) = \frac{x}{x - 1}$

51. $f(x) = \cos x - x, \quad [0, 4\pi]$

52. $f(x) = 2 \sin x + \cos 2x, \quad [0, 2\pi]$