Mid-Term Review

1. Find the domain of $f(x) = \frac{1}{\sqrt{3+2x}}$

2. What is the range of $f(x) = 3(x-2)^2 + 5$?

3. Describe the symmetry of $y = |x| - 2$

4. Describe the symmetry of $f(x) = \frac{x^2}{x^2+1}$

5. Find the horizontal asymptote of $f(x) = \frac{3x^2+2x-16}{x^2-7}$

6. Find the vertical asymptote of $y = \frac{2}{x-3}$

7. If $f(x) = 2x^2 + 1$ and $g(x) = x + 2$, then $(f \circ g)(x) =$

8. If $f(x) = \frac{2x+1}{3}$, find $f^{-1}(x)$

9. $\lim\limits_{x \to 3} \frac{x^2-8x+15}{(x-3)^2} =$

10. $\lim\limits_{x \to 27} \frac{\left(x^{\frac{1}{3}}-3\right)}{x-27} =$

11. $\lim_{x \to 0^-} \frac{1}{x} =$

12. $\lim_{x \to 0^+} \frac{1}{x} =$

13. Given a function is defined by $f(x) = \frac{2x+2}{x^2+5x+4}$, for what value(s) of x does the function have one or more vertical asymptotes?

14. Given a function defined by $f(x) = \frac{2x+1}{x^2+5x+4}$, for what values of x is the function discontinuous?

15. If $f(x) = -\frac{4}{\sqrt[4]{x}}$, then $f'(16) =$

16. Find the derivative, $\frac{dy}{dx}$, of $y = \frac{3x}{x^2+1}$

17. If $y = -\frac{4}{\sqrt[3]{x+5}}$, then $\frac{dy}{dx} =$

18. Find the derivative of $y = \sqrt[3]{x^2 + x}$

19. Find the derivative of $y = (x^2 + 2x + 5)^6$

20. Find $f'(x)$ for $f(x) = (2x^2 + 5)^7$

21. Given $y = \sin(\sin x)$, then $\frac{dy}{dx} =$

22. If $y = \cos(e^x)$, then $\frac{dy}{dx} =$

23. Find $f'(x)$ fiven $f(x) = \sin^3(4x)$

24. Given $y = \sin^2 x^3$, then $\frac{dy}{dx} =$

25. Find $\frac{dy}{dx}$ if $y = x^2 \cdot e^x$

26. $\frac{d}{dx} \ln \frac{5}{5-x} =$

27. If $y = e^{\frac{1}{x}}$, then $y' =$

28. $\frac{d}{dx} e^{\ln 5x} =$

29. $\frac{d}{dx} \ln\left(e^{x^2}\right)$

30. Find $\frac{dy}{dx}$ given $y = \frac{x^3}{3^x}$

31. If $y = \log_3(2x^2 - 5)$, then $\frac{dy}{dx} =$

32. Find $\frac{d^2y}{dx^2}$ for $y = \frac{1-x}{x-3}$

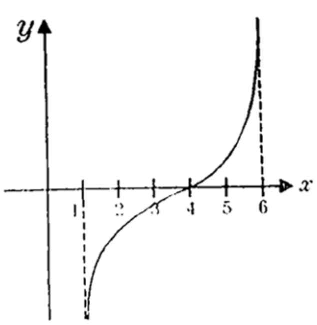
33. Find the slope of the tangent line to the graph f $f(x) = 2x(2x^2 - 1)$ at the point where $x = 1$

34. Find an equation of the tangent line to the curve $f(x) = -x^2 + 12$ passing through the point $(4,0)$

35. Find the critical numbers of $f(x) = x^3 - 12x^2$

36. Let $f(x) = x^2(x - 3)$. Over what interval is the function decreasing?

37. The figure shows the graph of ff', the derivative of the function f. The domain of the function f is $-10 \le x \le 10$. For what value(s) does the function have a relative maximum?



38. Refer to the previous figure. For what value(s) does the function have a relative minimum?

39. A particle's motion is described by $x(t) = 4t^3 - 5t^2$, $t \geq 0$, where t is in seconds and distance in meters. Find the velocity in the third second.

40. The position of a particle moving in a straight line at any time t is $x(t) = 2t^2 + 6t + 5$. What is the acceleration of the particle at $t = 3$?

41. Find all points of inflection for $f(x) = x^4 - 4x^3 + 2$

42. Find the interval(s) on which the curve $y = x^3 - 3x^2 - 9x + 6$ is concave upward or concave downward.

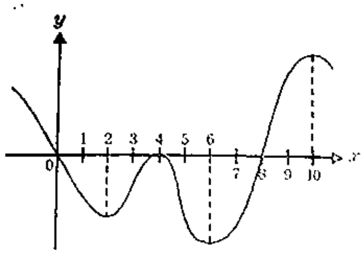
43. Given that $f(x) = \frac{4}{x}$, determine where the function is concave up and concave down.

44. Given that $f(x) = -x^2 + 12x - 34$ has a relative maximum at $x = 6$, determine where $f'(x)$ is positive and negative.

45. Find the point of inflection of $f(x) = x^3 - 3x^2 - x + 7$

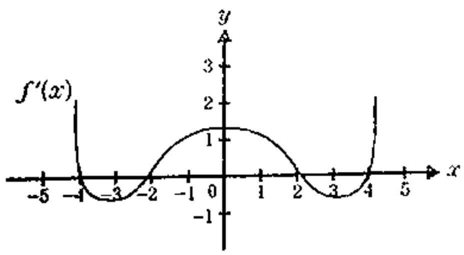
46. Given a function defined by $f(x) = 3x^5 - 5x^3 - 8$, for what value(s) of x is there a point of relative minimum?

47. The figure shows the graph of f', the derivative of the function f. The domain of the function f is $-10 \leq x \leq 10$. For what value(s) does the function have a relative minimum?

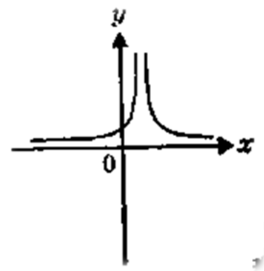


48. Refer to the previous figure. For what value(s) does the function have a relative maximum?

49. The graph $f(x)$ has horizontal tangents when $x =$



50. The graph of the derivative is shown. Draw the graph of f.



51. A ladder 10 feet long is leaning against a wall, with the foot of the ladder 8 feet away from the wall. I the foot of the ladder is being pulled away from the wall at 3 ft/sec how fast is the top of the ladder sliding down the wall?

52. Find all value(s) of x (if any) that satisfy the conclusion of the Mean Value Theorem for the function $f(x) = \frac{1}{1+x}$ on the interval $[0,1]$.

53. A farmer has 20 feet of fence, and he wishes to make from it a rectangular pen for his pig Wilbur, using a barn as one of the sides. In square feet, What is the maximum area possible for his pet?

54. Find the shortest distance from the point (4,0) to a point on the parabola $y^2 = 2x$.

55. A rectangle is inscribed between the parabola $y = 7 - x^2$ and the x-axis, with its base on the x-axis. Find the value of x that maximizes the area of the rectangle.

56. A circular conical reservoir, vertex down, has a depth 20 ft and radius of the top 10 ft. Water is leaking out so that the surface is falling at the rate of ½ ft/hr. Find the rate, in cubic feet per hour, at which the water is leaving the reservoir when the water is 8 feet deep.

57. One person is walking south toward an intersection that is 60 ft away at a rate of 2 ft/s while a second person on a bicycle is riding east away from the same intersection at 10 ft/s. If the bicyclist is 80 ft from the intersection, how fast is the distance between he and the person walking increasing?

For Questions 58-61. Suppose that the functions f and g have values according to the following table.

	f	f'	g	g'
-1	4	7	2	3
2	3	5	4	1

58. What is the value of the derivative of $f(g(x))$ and $x = -1$

59. Evaluate $\frac{d}{dx}[f(x)g(x)]_{x=2}$

60. Evaluate $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right]_{x=-1}$

61. Evaluate $\frac{d}{dx}[g^{-1}(x)]_{x=2}$