

Honors Calculus Mid-Term Review

Name _____

1. Find the domain of $f(x) = \frac{1}{\sqrt{5-3x}}$

2. What is the average rate of change of $f(x) = \frac{1}{x+2}$ over $[-3, 2]$?

3. Evaluate $f(x) = \begin{cases} 5x - 8, & x < 7 \\ \sqrt{x-7}, & 7 \leq x < 12 \\ \frac{4}{x}, & x \geq 12 \end{cases}$
for $f(3)$, $f(7)$, & $f(12)$.

4. Find the exact value of $\cos \frac{3\pi}{4}$, $\tan \frac{7\pi}{6}$, & $\sin \frac{5\pi}{3}$.

5. Find the horizontal & vertical asymptote of $f(x) = \frac{3x^2 + 2x - 16}{x^2 - 4}$

6. If $f(x) = 2x^2 + 1$ and $g(x) = x + 2$,
a. find $(f \circ g)(x) =$

b. find $(g \circ f)(x) =$

7. $f(x) = \begin{cases} \frac{x^2 - 25}{x + 5}, & \text{for } x \neq -5 \\ 3, & \text{for } x = -5 \end{cases}$

Which of the following are true about f ?

- I. $f(x)$ is continuous at $x = -5$
- II. $\lim_{x \rightarrow -5} f(x)$ exists
- III. $f(-5)$ exists

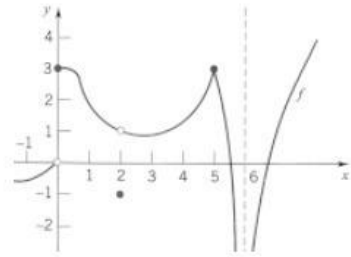
8. $f(x) = \begin{cases} x^2, & \text{for } x > 2, \\ 5ax, & \text{for } x \leq 2 \end{cases}$
For what value of a is the function continuous?

9. Determine if the function is continuous. If not, name the x-value & type of discontinuity.

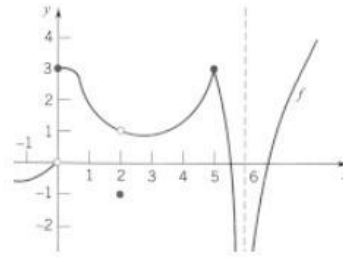
$$f(x) = \begin{cases} x^2 - 25, & x > -3 \\ 3x + 8, & x \leq -3 \end{cases}$$

10. Given a function defined by $f(x) = \frac{x+1}{x^2-4x+12}$, for what values of x is the function discontinuous?

11. List places & types of discontinuities for the graph below.



12. List places where the graph below is continuous but not differentiable.



13. $\lim_{x \rightarrow -1} -3x^2 + 2x =$

14. $\lim_{x \rightarrow -2} \frac{5x^2}{x - 3} =$

15. $\lim_{x \rightarrow -5} \frac{-1}{(x+5)^2} =$

16. $\lim_{x \rightarrow 9} \frac{x-9}{\sqrt{x}-3} =$

17. $\lim_{x \rightarrow 0^-} \frac{1}{x} =$

18. $\lim_{x \rightarrow 0} \frac{\sqrt{x+25}-5}{x} =$

19. $\lim_{x \rightarrow -2^-} \frac{|x+2|}{x+2} =$

20. $\lim_{x \rightarrow \infty} \frac{x^2 - x}{-4x} =$

21. $\lim_{x \rightarrow 3^+} \frac{|x-3|}{x-3} =$

22. $\lim_{x \rightarrow -\infty} \frac{x^2 - x}{-4x} =$

23. Use the definition of the derivative to find the derivative of $y = \frac{2}{x}$.

24. Use the definition of the derivative to find the derivative of $y = \sqrt{x-7}$

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

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

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

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

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

30. Find $f'(x)$ given $f(x) = \sin^3(4x)$

31. Given $y = \cos^3 x$, then $\frac{dy}{dx} =$

32. If $y = \cot(2x^3)$, then $\frac{dy}{dx} =$

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

34. Find $\frac{d}{dx}$ given $y = \ln e^4$

35. If $y = e^{x^4-3x^2}$, then $y' =$

36. $\frac{d}{dx} e^{\ln(\cos x)} =$

37. $\frac{d}{dx} \ln(e^{4x^2} + 3)$

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

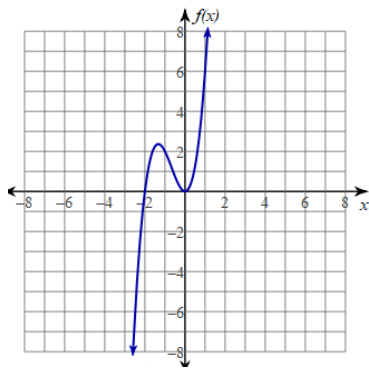
39. If $y = \ln(2x^2 - 5)$, then $\frac{dy}{dx} =$

40. Find $\frac{d^2y}{dx^2}$ if $y = \ln 5x^2$

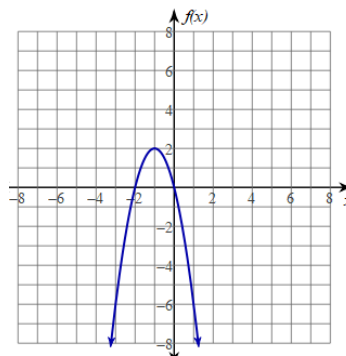
41. Find the slope of the tangent line to the graph $f(x) = 2x(2x^2 - 1)$ at the point where $x = 1$

42. Find an equation of the tangent line to the curve $f(x) = -x^2 + 12$ passing when $x = 4$.

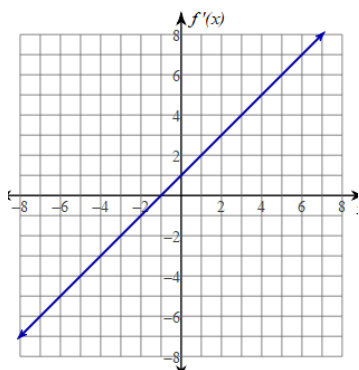
43. Given the graph of $f(x)$ below, sketch a possible graph of $f'(x)$.



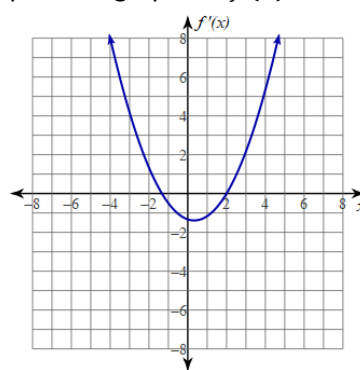
44. Given the graph of $f(x)$ below, list where $f'(x)$ will be positive, negative, and zero.



45. Given the graph of f' , list where the graph of $f(x)$ has intervals of increase & decrease.



46. Given the graph of f' , the derivative of f . Sketch a possible graph for $f(x)$.



Use the table for # 47 – 50

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	2	2	4	-2
2	4	$\frac{1}{2}$	2	$-\frac{3}{2}$
3	3	$-\frac{3}{2}$	1	$\frac{1}{2}$
4	1	-2	3	2

47. $h(x) = f(x) - g(x)$, find $h'(3)$

48. $h(x) = f(x) \cdot g(x)$, find $h'(4)$

49. $h(x) = \frac{f(x)}{g(x)}$, find $h'(2)$

50. $h(x) = f(g(x))$, find $h'(1)$

51. Evaluate the limit using L'Hopital's Rule

$$\lim_{x \rightarrow 0} \frac{5x}{\ln(x+1)}$$

52. Evaluate the limit using L'Hopital's Rule

$$\lim_{x \rightarrow 0} \frac{e^{4x} - 1}{\sin(5x)}$$

53. Evaluate the limit using L'Hopital's Rule

$$\lim_{x \rightarrow \infty} \frac{e^{3x}}{x}$$

54. Use implicit differentiation to find $\frac{dy}{dx}$ in terms of x and y for $-2x + 2 = 3x^2 + 4y^2$.

55. Use implicit differentiation to find $\frac{dy}{dx}$ in terms of x and y for $3y + 4xy^2 = 3x$.

56. Use implicit differentiation to find $\frac{dy}{dx}$ for $x^3 = 4y^2 + 5x^3$ at the point $(-1, -1)$.