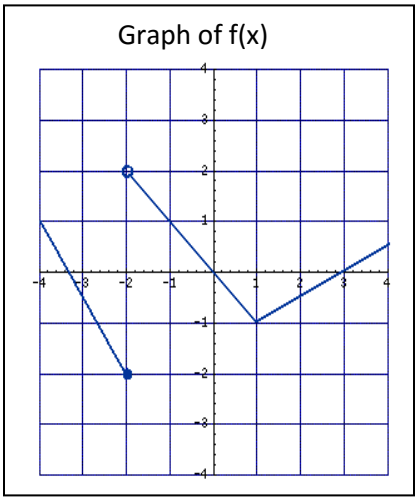
Chapters 1 – 4.2 Review DO NOT WRITE ON THIS WORKSEET!

1. Limit Notation: Write the limit of g(z) as z approaches (- 3) from the left side.

2. $h(x)=\begin{cases}-x-4; & x=0\\ x-4; & x\neq 0\end{cases}$ Find $\lim_{x\to 0^-} h(x)$.

3. $h(x)=\begin{cases}-3x-3; & x<2\\ -x-4; & x\geq 2\end{cases}$ Find $\lim_{x\to 2} h(x)$.



4. Refer to Figure on the Right. $\lim_{x\to 1} f(x)$

5. Refer to Figure on the Right. $\lim_{x\to -2^-} f(x)$

6. Refer to Figure on the Right. $\lim_{x\to -2} f(x)$

7. Refer to Figure on the Right. Is the function continuous at x = 1?

8. Refer to Figure on the Right. Is the function continuous at x = -2

9. $\lim_{x\to 2}\dfrac{4x^2-8x}{x-2}=$

10. $\lim_{x\to -2} 5=$

11. $\lim_{x\to \frac{1}{4}}\dfrac{\sqrt{x+4}-\sqrt{4}}{4x-1}=$

12. $\lim_{x\to \frac{-\pi}{3}} \sin x=$

13. Given $f(x)=3x^2-3x-2$ and $g(x)=-5x^2+5x+3$. Find $\lim_{x\to -1} g(f(x))$.

14. Find $\lim_{x\to\infty}\dfrac{6x+2\sin x}{9x+7}$

15. $g(x)=\begin{cases}-x; & x<2\\ -3; & x\geq 2\end{cases}$ Is the function continuous at x = 2.

16. What are the vertical asymptotes of: $f(x)=\dfrac{-4x^3+3x-1}{x^3-2x^2-15x+36}$?

17. What are the horizontal asymptotes of: $f(x)=\dfrac{-4x^3+3x-1}{x^3-2x^2-15x+36}$?

18. Find the slope of the tangent line to $w(x)=-5x^3+2x^2+3x-2$ at the point (-1, 2).

19. Find r'(x) where $r(x) = -3x^2 + 3x + 1$.

20. Find t'(-2) where $t(x) = \dfrac{4x-3}{3x-4}$.

21. Copy the figure at the right and graph its derivative.

22. Is $m(x) = |x + 2| + 1$ differentiable at x = -2?

23. $h(x) = \begin{cases} 3; & x < -3 \\ -2x - 3; & x \geq -3 \end{cases}$. Is h(x) differentiable at x = 10?

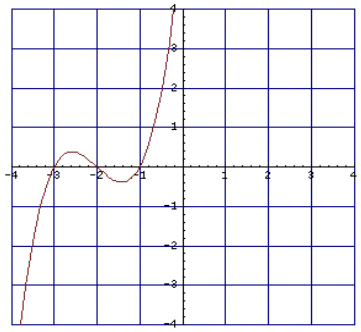
For #'s 24 – 26, refer to the figure at the right.

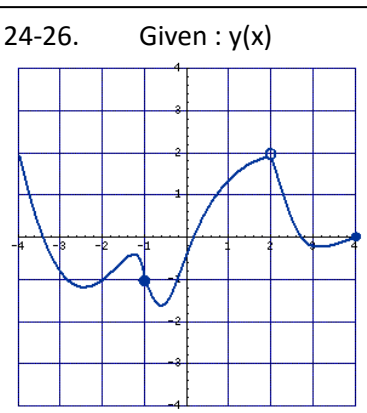
24. Is y(x) differentiable at x = 2?

25. Is y(x) continuous at x = 2?

26. Is y(x) continuous, differentiable, both, or neither at x = 3?

27. $k(x) = 2|x + 2| + 3$ Cont., differentiable, both, or neither at x = -2?





28. Find the equation of the tangent line to $a(x) = -2x^2 - 4x + 2$ at the point (1,-4).

For #'s 29 – 32, find the derivative.

29. $\sqrt{x^2 - 2}$

30. $\dfrac{\left(x^2+1\right)^2}{2x}$

31. $\sin^3\left(3x^4 - 2x\right)^2$

32. $\left(3x^3 - 5x\right)^2 \cos^2 2x$

33. Find the second derivative of problem # 30.

34. Given the position equation: $s(t) = -3t^2 - 2t + 2$, find the average velocity from t = 1 to t = 2.

35. Given the position equation: $s(t) = -3t^2 - t + 3$, find the instantaneous velocity at t = 2.

36. The number of people in Kentucky affected by the flu over October is defined by N = f(x) where x is the day of the month. f(x) = x + 3. Find the average rate of change of N with respect to x when days is changed from x = 20 to x = 69.

37. Find all critical points of $u(x) = -8x^3 + 27x^2 - 30x + 19$.

38. Find the maximum of: $f(x) = \dfrac{x^2}{x+2}$ over $[3,8]$.

39. Verify that $q(x) = -5x^2 + 30x - 48$ over [1,5] satisfies Rolle's Theorem, then find all numbers c that satisfy the conclusion of Rolle's Theorem.

40. Verify that $a(x) = 3x^2 + x - 3$ over [-1,3] satisfies the Mean Value Theorem, then find all numbers c that satisfy the conclusion of the Mean Value Theorem.

41. Find the intervals on which $k(x) = -5x^2 + 4x - 4$ is increasing or decreasing.

42. Apply the first derivative test on $n(x) = x^3 + 6x^2 + 9x - 4$ to find all local maximum and minimums.

43. Starting at a height of 2 feet, a ball is thrown upwards with an initial velocity of 96 feet/sec. The ball's height after t seconds is $s(t) = -16x^2 + 96x + 2$. Find the maximum height of the ball.

44. Find the intervals on which $m(x) = x^3 - 4x^2 - x - 2$ is concave up or down.

45. Find all inflection points of $w(x) = x^3 - 3x^2 - 4x - 4$.

46. Apply the second derivative test on $p(x) = x^3 + 15x^2 + 75x - 3$ to find all local maximum and minimums.

47. Farmer Jacob has a fence of length 30 ft. Jacob wants to create the biggest grazing area possible. What is the maximal area of the grazing area?

48. A box is constructed out of two different materials. The material for the top and bottom (both square pieces) cost \$1/ft^2 and the material for the sides costs \$2/ft^2. Find the dimensions that minimize the cost if the box has a volume of 170 ft^3.

49. Use Newton's method to approximate a zero of $p(x) = -2x^3 - 3x^2 + 3x + 3$. Start with x = -1, and do 4 repetitions.

For #'s 50 – 53, find the indefinite integral.

50. $\int \frac{2}{5} x^6 \, dx =$

51. $\int \frac{2x^4 + 3x - 6}{2\sqrt{x}} \, dx =$

52. $\int \frac{\sqrt[4]{x^3}}{\sqrt{x}} \, dx =$

53. $\int \left(3x^{-4} - \sin x\right) dx =$

54. Solve the differential equation given $f'(x) = 2x^2 + x, \; f(1) = -2.$

55. $\int_1^{81} x^{\frac{1}{4}} \, dx =$

56. $\int_3^5 \left(x^2 - 7x + 3\right) dx =$

57. Find the derivative implicitly:

$a)\quad x^2 + y^3 = 2y$

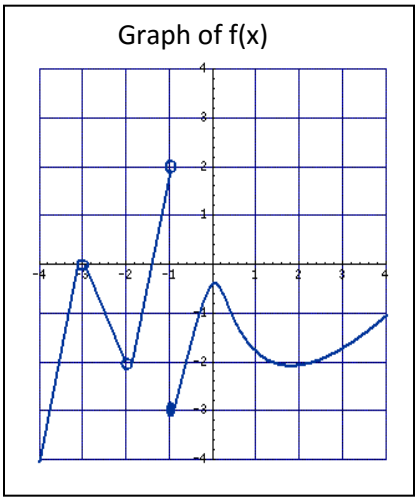
$b)\quad xy - (x^2 + y) = 2$

$c)\quad \sin\left(y^2\right)$

$d)\quad \cos(xy)$

Chapters 1 – 4 Additional Review

1. $h(x)=\begin{cases}4; & x=0\\ x-4; & x\neq 0\end{cases}$ Find $\lim_{x\to 0} h(x)$.



2. Find $\lim_{x\to 0}\frac{\sin x}{x}$.

3. Refer to Figure on the Right. $\lim_{x\to -1^-} f(x)$

4. Refer to Figure on the Right. $\lim_{x\to -2^-} f(x)$

5. Refer to Figure on the Right. $\lim_{x\to -2} f(x)$

6. Refer to Figure on the Right. Is the function continuous at x = -1?

7. Refer to Figure on the Right. Is the function continuous at x = -2?

8. Refer to Figure on the Right. Is the function differentiable at x = -3?

9. Refer to Figure on the Right. Is the function differentiable at x = 0?

10. $\lim_{x\to 0}\frac{\sqrt{x+4}-\sqrt{4}}{4x}=$

11. Find $\lim_{x\to\infty}\frac{(6x+2)(3x-1)}{(2x+7)x}$

12. $\lim_{x\to -\frac{\pi}{3}} \tan x=$

13. Find the slope of the tangent line to $f(x)=(2x+3)^2$ at the point (-1, 2).

14. Find t'(x) where $t(x)=\frac{2x-1}{x^2+2}$.

15. Know first Derivative Test, Second Derivative Test, Relationship between 1st Derivative, 2nd Derivative, increasing, decreasing, concavity, point of inflection, inflection #'s/point(s).

16. Find the first derivative for: $\sin^3\left(\cos x^4-2\right)^2$

17. Know the difference between average rate and average value.

18. Know Rolle's Theorem, Mean Value Theorem for both derivatives and integrals,.

19. Know Maximization Problems.

20. Be able to integrate, and know your trig derivatives/integrals.