

Worksheet #13
Review for Test #3: Derivatives

Use the limit definition of derivative to find the derivatives of the functions in problems 1-4.

1. $y = 2x^2 + 1$	2. $f(x) = 3x - 4$	3. $g(x) = x^3 + 1$	4. $y = \frac{2}{x+4}$
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Find the derivative of each function below.

5. $y = \frac{2-x}{3x+1}$	6. $y = \sqrt{3-2x}$	7. $y = \frac{2}{(5x+1)^3}$	8. $y = 3x^{\frac{2}{3}} - 4x^{\frac{1}{2}} - 2$
9. $y = 2\sqrt{x} - \frac{1}{2\sqrt{x}}$	10. $y = \frac{x}{\sqrt{1-x^2}}$	11. Which choice is the derivative of $y = (4x+1)^2(1-x)^3$ A) $(4x+1)^2(1-x)^2(5-20x)$ B) $(4x+1)(1-x)^2(4x+11)$ C) $5(4x+1)(1-x)^2(1-4x)$ D) $(4x+1)(1-x)^2(11-20x)$ E) $-24(4x+1)(1-x)^2$	
12. $y = \frac{1}{x}$, Find $y^{IV}(1)$	13. $y = \sqrt{x^2 + 2x - 5}$	14. $y = 5$	15. Find $f'''(2)$ for $f(x) = x^4 - 4x^2$
16. $f(x) = x\sqrt{x}$	17. $f(x) = \frac{x-1}{\sqrt{2x}}$	18. $y = (x^2 - 2)(x^{-1} + 2)$	19. $y = \left(\frac{x}{x^2 - 1}\right)^{-1}$
20. $y = 3x^2 + \frac{2}{x} - \frac{5}{x^2}$	21. $y = \frac{x^{-5}}{5} - \frac{x^{-2}}{2} + x^{-1} + 4$	22. $f(x) = \left(\frac{x-1}{x+1}\right)^3$	

Answer each question about tangents and normals.

23. Find the points on the curve $y = 2x^3 - 3x^2 - 12x + 20$ where the tangent is parallel to the x-axis.
24. Find the x and y intercepts of the line that is tangent to the curve $y = x^3$ at the point $(-2, -8)$.
25. If the line $-4x + y = 2$ is tangent to the curve $y = \frac{1}{3}x^3 + c$, find c.
26. Find the slope of the normal to $f(x) = 2x^3 + x^2 - 1$ at the point where $x = \frac{1}{2}$.
27. Find the equation of the tangent to $y = \sqrt{x^3 + 1}$ at the point where $x = -1$.
28. Graph the function whose equation is $g(x) = \frac{1}{x-2}$ then find and graph the tangent at the point $(3, f(3))$.
29. Find $\frac{dy}{dx}$ for $y = (x^2 + 1)(x^3 + 1)$ then find the slope of the normal when $x = -1$
30. Graph the function $y = 2x^2 + 4x - 1$ then find and graph the tangent line at the point where $x = 1$.
31. Find an equation of the line perpendicular to the tangent to the curve $y = x^4 + x - 1$ at the point $(1, 1)$.
32. Find the points on the curve $\sqrt{x+1}$ where the tangent is parallel to the y-axis.
33. If the line $y = 2x + 4$ is tangent to the curve $y = \frac{1}{2}x^4 + c$, find c.
34. Find $\frac{dy}{dx}$ for $y = (x-1)(x^2 + 5x - 1)$ then find the slope of the tangent when $x = 3$
35. Find the x and y intercepts of the line that is tangent to the curve $4\sqrt{x^2 - 5}$ at the point $(3, 8)$.
36. Find the slope of the tangent line and the normal line to the curve $y = x\sqrt{x+1}$ at the point where $x = 1$.

37. If the line $2x-y=3$ is tangent to the function $f(x) = x^2 + 2x - 3$, what is the point of tangency?
38. If the slope of a tangent line is 5 then what is the slope of the normal line to the same curve at the same point?
39. At what x-value is $y = 3x - 1$ tangent to $f(x) = x^3 + 1$.
40. Find the equation of the normal line to the curve $f(x) = \left(\frac{x-1}{x+1}\right)^{-2}$ at the point where $x=2$.

Answers:

1. $4x$	2. 3	3. $3x^2$	4. $\frac{-2}{(x+4)^2}$	5. $\frac{-7}{(3x+1)^2}$
6. $\frac{-1}{\sqrt{3-2x}}$	7. $\frac{-30}{(5x+1)^4}$	8. $2x^{-1/3} - 2x^{-1/2}$	9. $\frac{4x+1}{4x\sqrt{x}}$	10. $\frac{1}{\sqrt{(1-x^2)^3}}$
11. C	12. 24	13. $\frac{x+1}{\sqrt{x^2+2x-5}}$	14. 0	15. 48
16. $\frac{3}{2}\sqrt{x}$	17. $\frac{x+1}{\sqrt{(2x)^3}}$	18. $4x+2x^{-2}+1$	19. $\frac{x^2+1}{x^2}$	20. $6x - \frac{2}{x^2} + \frac{10}{x^3}$
21. $-x^{-6} - x^{-3} - x^{-2}$	22. $\frac{6(x-1)^2}{(x+1)^4}$	23. $x = -1, 2$	24. $\left(\frac{-4}{3}, 0\right), (0, 16)$	25. $\frac{-26}{3}, \frac{38}{3}$
26. $\frac{-2}{5}$	27. $x = -1$	28. $y = -x + 4$ (solution also requires graph of function and tangent line)	29. $5x^4 + 3x^2 + 2x, \frac{-1}{6}$	30. $y = 8x - 3$ (solution also requires graph of function and tangent line)
31. $y - 1 = \frac{-1}{5}(x - 1)$	32. $(-1, 0)$	33. 5.5	34. 50	35. $(5/3, 0), (0, -10)$
36. $\frac{5}{2\sqrt{2}}, \frac{-2\sqrt{2}}{5}$	37. $(0, -3)$	38. $\frac{-1}{5}$	39. $x = 1$	40. $y - 9 = \frac{1}{12}(x - 2)$

