

Section 3.2: Additional Problems

1. Find the equation of the tangent line and the normal line at $x = 2$ for $f(x) = \frac{x}{x-1}$
2. Find the value(s) of x where the tangent line to $f(x) = \frac{x}{x-1}$ will go through the point $(6, -2)$. Show the work that verifies your answers.
3. Find $\frac{d^2y}{dx^2}$ for $y = \frac{x^2 + 5}{x + 7}$

In problems 4-10 find the derivative. You do not have to simplify.

4. $y = (x^7 + 3x^4 + 5)(x^8 + 7x + 1)$
5. $y = (x^9 + \frac{1}{x^5})(x^{-3} - 2x^{-2})$
6. $y = (x^3 + 4x + 2)e^x$
7. $f(x) = (x^3 + 5x^2 + 1)\log_4 x$
8. $y = \frac{x^4 + 7x^2 + 8}{x^5 + 5x^3 + 6}$
9. $y = \frac{3^x + 7x}{x^4 + 7x^3 + 5}$
10. $f(x) = \frac{x^4 e^x}{x^5 + 7x}$

Problems 11-14 refer to the functions f and g that satisfy the properties as shown in the table. Find the indicated quantity.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
0	1	-3	3	5
1	2	6	7	11
2	-5	0	2	10
3	4	-1	-4	8

Note: The table shows that $f'(3) = -1$, $g(1) = 7$

11. $J'(0)$ if $J(x) = f(x)g(x)$
12. $H'(3)$ if $H(x) = (x^3 - 7x + 3)g(x)$
13. $K'(1)$ if $K(x) = \frac{x^3 + \ln(x)}{f(x)}$
14. $M'(2)$ if $M(x) = \frac{e^x}{f(x) + g(x)}$

For problems 15-17, find the values of x where the tangent line is horizontal.

15. $y = \frac{-x + 2}{x^2 + 12}$

16. $y = \frac{1}{x^2 - 6x + 10}$

17. $y = \frac{3}{x^2 + 10x}$

18. Find the value(s) of x where $y = \frac{2x + 3}{x + 4}$ has an instantaneous rate of change of 5.

19. Find the value(s) of x where $y = \frac{-x + 3}{x - 5}$ has an instantaneous rate of change of 2.