2.6 Constant, Const. Multiple, Sum/Diff Rules

CA #1

Calculus Name: _____

Find the derivative of each function.

1. $y = 3x^{100} - 2x^8 - 7x$

2. $V(r) = \frac{4}{3}\pi r^3$

3. $f(x) = \frac{1}{x^3} + \frac{12}{x}$

4. $y = \sqrt[3]{x^2} + 8\sqrt[4]{x^7}$

5. $y = \frac{1}{x^3} - \frac{1}{2}x^4 + ex^2$

Find the x-value(s) where the function has a horizontal tangent.

6. $f(x) = \frac{x^3}{3} - 3x^2 + 9x - 10$

7. $f(x) = \frac{x^4}{4} + x^3 + x^2 + 1$

Find the equations of the tangent AND normal lines of each function at the given value of x.

8. $y = x^2 + 6x + 9$ at $x = -2$

Tangent: _____

Normal: _____

9. $f(x) = -2\sqrt{x} + 4x$ at $x = 9$

Tangent: _____

Normal: _____

Are the functions differentiable at the given value of x?

10. At $x = 2$.

$$f(x) = \begin{cases} \frac{12}{x^2} - 3x + 2, & x < 2 \\ x^3 - 3x^2 + 3, & x \geq 2 \end{cases}$$

11. At $x = 1$.

$$f(x) = \begin{cases} x - \frac{3}{x}, & x \leq 1 \\ 2x - \frac{4}{\sqrt{x}}, & x > 1 \end{cases}$$

What values of a and b would make the function differentiable at the given value of x?

12. At $x = -1$

$$f(x) = \begin{cases} x^3 - ax + 4, & x \leq -1 \\ ax^2 + bx - 2, & x > -1 \end{cases}$$

13. At $x = 1$.

$$f(x) = \begin{cases} ax^2 + bx, & x < 1 \\ x - b, & x \geq 1 \end{cases}$$

Answers to 2.6 CA #1

1. $\frac{dy}{dx} = 300x^{99} - 16x^7 - 7$	2. $V'(r) = 4\pi r^2$	3. $f'(x) = -\frac{3}{x^4} - \frac{12}{x^2}$	4. $\frac{dy}{dx} = \frac{2}{3\sqrt[3]{x}} + 14\sqrt[4]{x^3}$
5. $\frac{dy}{dx} = -\frac{3}{x^4} - 2x^3 + 2ex$	6. $x = 3$	7. $x = 0, -2, -1$	8. T: $y - 1 = 2(x + 2)$ N: $y - 1 = -\frac{1}{2}(x + 2)$
9. T: $y - 30 = \frac{11}{3}(x - 9)$ N: $y - 30 = -\frac{3}{11}(x - 9)$	10. No. Continuous, but not differentiable.	11. Yes.	12. $a = -8, b = -5$	13. $a = \frac{1}{3}, b = \frac{1}{3}$