Brief Calculus   Worksheet 4.1-4.3   Name_____

Find the derivative of each function.

1. $f(t) = \dfrac{t^4}{4}$

2. $f(x) = \dfrac{2}{3}x^6 + \dfrac{2}{5}x^5$

3. $r(t) = \dfrac{3-t}{5}$

4. $y = x^{\sqrt{5}}$

5. $f(x) = ax^2 + bx + c$

6. $f(x) = 3x^3 - \dfrac{1}{3x^2}$

7. $f(x) = \dfrac{1}{\sqrt[4]{x^3}}$

8. $f(x) = \dfrac{1}{\sqrt[3]{x^2}} - 3x^{-2} + x^2 + 1$

9. $\dfrac{dV}{dr}$ if $V = \dfrac{4}{3}\pi r^3$

Find the value of the derivative at the indicated point.

10. $y = \dfrac{1}{2}x^2$ at $\left(1, \dfrac{1}{2}\right)$

Find the slope of the tangent line to the graph of the function f at the indicated point.
What is the equation of the tangent line at the indicated point?

11. $y = x^3 + 3x - 1$ at $(0, -1)$

Find those x, if any, at which $f'(x) = 0$.

12. $f(x) = x^3 - 3x + 2$

Find any **points** at which the graph of f has a horizontal tangent line.

13. $f(x) = x^5 - 10x^4$

14. **Supply and Demand**   Suppose $S(x) = 50x^2 - 50x$ is the supply function describing the number of
   crates of grapefruit a farmer is willing to supply to the market for x dollars per crate.
   a.   How many crates is the farmer willing to supply for $10 per crate?
   b.   How many crates is the farmer willing to supply for $13 per crate?
   c.   Find the average rate of change in supply from $10 per crate to $13 per crate?
   d.   Find the instantaneous rate of change in supply at $x = 10$.

Find the derivative of each function by using the **formula for the derivative of a product**.

15. $f(x) = (x^5 + 1)(3x^3 + 8)$

16. $f(x) = (x^3 - 1)(3x^2 - 2x + 1)$

Find the slope of the tangent line to the graph of the function f at the indicated point. What is the equation of the tangent line at the indicated point?

17. $f(x) = (x^3 - 2x + 2)(x + 1)$ at $(1, 2)$

18. Find y' if $y = \dfrac{2x^2 - 1}{5x + 2}$

19. Find $f'(x)$ if $f(x) = \dfrac{-2}{x^2}$

20. Find y' if $y = \dfrac{(2x + 3)(x - 4)}{3x + 5}$

21. Find $\dfrac{dy}{dx}$ if $y = \dfrac{(3x + 4)(2x - 3)}{(2x + 1)(3x - 2)}$

22. **Value of a Car** The value v of a luxury car after t years is $v(t) = \dfrac{10,000}{t} + 6000$ for $1 \le t \le 6$.

    a. Graph $v(t)$.
    b. What is the average rate of change in value from $t = 2$ to $t = 5$?
    c. What is the instantaneous rate of change in value?
    d. What is the instantaneous rate of change after 2 years?
    e. What is the instantaneous rate of change after 5 years?
    f. Interpret the answers found in parts c and d of this question.