

**Differentiation Formulas**

1. Differentiate :  $h(t) = 8t^4 + 6\sqrt[4]{t^3} - \frac{1}{3t^{10}} + 2$

2. Find the equation of the tangent line to  $g(x) = \sqrt{x^5} (x^{-4} + \sqrt[7]{x^2})$  at  $x = 1$ .

3. Find the point(s) where the tangent line to  $f(x) = x^3 + 4x^2 - 8x + 3$  will be perpendicular to  $y = 9 + \frac{1}{4}x$ .

4. The position function of an object is  $s(t) = t^3 - 18t^2 + 96t + 8$  where  $t$  is in seconds and  $s$  is in feet.

Assume that the object starts moving at  $t = 0$  and answer the following questions.

(a) What is the velocity of the object at any time  $t$ ?

(b) When, if ever, is the object at rest (*i.e.* not moving)?

(c) When is the object moving to the right and when is it moving to the left?

5. What percentage of the range  $[-3,4]$  is  $f(z) = 90 + 10z^3 - z^4 - 2z^5$  decreasing?

**Product and Quotient Rule**

For problems 6 & 7 use the Product or Quotient Rule to find the derivative.

6.  $h(t) = (2t^2 + t^{-4})\left(\frac{7}{t} - 3t\right)$

7.  $W(y) = \frac{y^2 - 3y}{7 - y^2}$

8. Determine where the function  $G(x) = \frac{x^2 + 10}{x^2 + 6x + 10}$  is not changing.

**Derivative of Trig Functions**

For problems 9 – 11 differentiate the given function.

9.  $g(t) = 8\sec(t) + t^2 \csc(t)$

10.  $y = \frac{\cot(z)}{6 + \sin(z)}$

11.  $Y(\theta) = \theta^2 - 15\cos(\theta)\sin(\theta)$

Continued on Back  $\Rightarrow$

12. Find the equation of the tangent line to  $y = x \tan(x)$  at  $x = \frac{\pi}{4}$ .

13. The amount of money in an account (in thousands) is given by  $A(t) = 2t - 7 \sin(t) + 12$  where  $t$  is in years. When during the first 10 years is the amount of money in the account not changing?