Differentiation Formulas

1. Differentiate : $h(t)=10t^9-\dfrac{2}{\sqrt[7]{t^3}}+\dfrac{1}{9t^2}-12$

2. Find the equation of the tangent line to $g(x)=x^4\left(15x-2x^{-3}\right)$ at $x=-2$.

3. Find the point(s) where the tangent lines to $f(x)=x^3+7x^2-2x+14$ and $g(x)=5-x-4x^2$ will be parallel.

4. The position function of an object is $s(t)=2t^3-51t^2+360t+60$ 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 [-8, 4] is $f(w)=w^4+3w^3-22w^2+2$ decreasing?

Product and Quotient Rule

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

6. $R(z)=\left(2\sqrt{z}+3\right)\left(\sqrt[3]{z^4}-\sqrt{z^5}\right)$

7. $f(x)=\dfrac{1-6x}{10-x+3x^2}$

8. Determine where the function $V(t)=\dfrac{t^2}{2t^2-3t+4}$ is not changing.

Derivative of Trig Functions

For problems 9 – 11 differentiate the given function.

9. $g(t)=4\sec(t)-8\csc(t)+t\sin(t)$

10. $y=\dfrac{5+\tan(x)}{3-\cot(x)}$

11. $h(\theta)=3\cos(\theta)\sin(\theta)-\theta^4\sec\theta$

Continued on Back $\Rightarrow$

12. Find the equation of the tangent line to $y = \frac{3}{1-\cos(x)}$ at $x = \pi$.

13. The population of fish (in hundreds) in a lake is given by $P(t) = 7t + 12\sin(t) + 1$ where *t* is in years. When in the first 180 months is the population not changing?