Name: _____ Score: _____

Teacher: _____ Date: _____

Derivative - Product rule

For questions 1 – 5, Use the product rule of derivative to find the derivative of the following functions.

1. $y = \sqrt[3]{x^2}\left(\frac{2}{x} - x^3\right)$
2. $f(t) = (4t^2 - t)(t^3 - 8t^2 + 12)$
3. $g(z) = (1 + 2z + 3z^2)(5z + 8z^2 - z^3)$
4. $g(z) = z^2\left(\frac{2}{z^2} + \frac{5}{z^3}\right)$
5. $h(y) = \left(1 + \sqrt{y^3}\right)\left(\frac{1}{y^3} - 2\sqrt[3]{y}\right)$
6. Find the equation of the tangent line to $f(x) = (8 - x^3)(1 + x + x^2)$ at $x = -2$
7. Find the equation of the tangent line to $f(x) = (1 + 12\sqrt{x})(4 - x^2)$ at $x = 9$

For questions 6 – 11 find the gradient of the tangent to: (give answers to 3 significant figures if not exact)

6. $f(x) = x^4(1 - 3x)^2$ at $x = 1$
7. $f(x) = x \tan x$ at $x = \pi$
8. $f(x) = x^2 e^{-x}$ at $x = 2$
9. $f(x) = 2x^6(1 + x)^5$ at $x = -1$
10. $f(x) = x^3\sqrt{4 - x}$ at $x = 3$
11. Find the equation of the tangent line to $f(x) = (8 - x^3)(1 + x + x^2)$ at $x = -2$
12. Find the equation of the tangent line to $f(x) = (1 + 12\sqrt{x})(4 - x^2)$ at $x = 9$
13. Find the x-coordinates of any point on $y = (1 - x^3)e^{2x}$ where the tangent is horizontal.