2.3 The Product Rule, and The Power of a Function Rule

1) Use the Product Rule to differentiate the following (simplify as much as possible):
   a. $f(x)=\left(3x^2-5x+1\right)\left(2x^3-7x^2+2x-5\right)$
   b. $g(x)=(2x-1)(x+7)(-3x+2)$

2) Use the Power of a Function Rule to differentiate the following:
   a. $f(x)=(2x+3)^{43}$
   b. $g(x)=\left(3x^2-5x+1\right)^{-2}$
   c. $h(x)=\dfrac{1}{\left(2x-17x^3\right)^{11}}$

3) We didn't see any of these in the lesson, but **I believe in you**. Differentiate each of the following (*Note: You'll need to use the Product Rule and the Power of a Function Rule, and the basic Power Rule!*). Simplify as much as possible (Remember – Factored Form is your Friend!)
   a. $f(x)=(x-5)^2(x+1)^5$
   b. $g(x)=\dfrac{x+1}{x-1}$ (*Hint: rewrite the function as a product of two functions*)
   c. $f(x)=(2x+3)^2(3x-5)^3$
   d. $h(x)=(x-3)^3(2x+1)^2$
   e. $f(x)=(x-2)^2(3x+2)^3(x+4)^2$ (*Triple product…*)

4) Determine the equation of the tangent to the curve $f(x)=(x+3)^2(2x+1)^3$ at the point $(-1,-4)$.

5) Determine the point(s) on the curve $h(x)=3(x-1)\left(x^2-4\right)$ where the tangent is horizontal. Round your values to two decimal places. (*Hint: What is the slope of a horizontal line?*)

Answers on other side

Answers to Selected Problems

1) $f'(x)=(6x-5)(2x^3-7x^2+2x-5)+(3x^2-5x+1)(6x^2-14x+2)$

2) $g'(x)=\dfrac{-2(6x^2-5)}{(3x^2-5x+1)^3}$

3a) $f'(x)=(x-5)(x+1)^4(7x-23)$

3c) $f'(x)=(2x+3)(3x-5)^2(30x+7)$

5) $(-0.87,1.26)$, and $(1.54,-2.64)$