2.4 The Quotient Rule

1. Use the Quotient Rule to differentiate the following functions (simplify as much as possible):
   a. $f(x)=\dfrac{2x^3}{x-1}$ b. $g(x)=\dfrac{3x-5}{(2x+1)^2}$ c. $h(x)=\dfrac{x^2+3x+5}{x^2-7}$

2. Determine the equation of the tangent to the curve $f(x)=\dfrac{2x^4}{(x-2)^2}$ at the point $(1,2)$.

3. Determine the point(s) on the graph of $g(x)=\dfrac{5x}{x-1}$ where the tangent(s) to $g(x)$ are *perpendicular* to the line $5x-y+1=0$.

4. An initial population, *p*, of 1000 bacteria grows in number according to the function $p(t)=1000\left(1+\dfrac{4t}{t^2+50}\right)$, where *t* is in hours. Find the *rate* at which the population is growing after 1 hour and again after 2 hours. (*From the Nelson Text: Pg. 98 #10*)

5. Find the points on the curve where the tangents are horizontal:
   a. $f(x)=\dfrac{x^2-4}{2x+5}$ b. $g(x)=\dfrac{(x+1)^2}{x}$ c. $h(x)=\dfrac{x^2-1}{x^2+x-2}$ (*Text: Pg. 98 #9b*)

6. The concentration, *c*, of a drug in the blood *t* hours after the drug is taken orally is modelled by $c(t)=\dfrac{5t}{2t^2+7}$. How long after taking the drug does its concentration in the blood reach a maximum? (*From the Text: Pg. 98 #15*)

Answers to selected problems:

1b) $g'(x)=\dfrac{-6x+23}{(2x+1)^3}$ c) $h'(x)=\dfrac{-3(x+7)(x+1)}{(x^2-7)^2}$ 3. $(6,6)$, $(-4,4)$

5b) $(-1,0)$, $(1,4)$ 6. 1.87 h