**Assignment #7** **Name** Answer Key

**Due 6 November 2009**

1. In each case, use the rules of differentiation to find $y'$.

(a) $y = 2\sqrt{t} + \dfrac{5t}{t^4 + 3t^2 + 7}$ $= 2t^{1/2} + \dfrac{5t}{t^4+3t^2+7}$

$$y' = 2 \cdot \frac{1}{2} \cdot t^{-1/2} + \frac{(t^4+3t^2+7)(5) - 5t(4t^3+6t)}{(t^4+3t^2+7)^2}$$

(b) $y = \dfrac{3t^2 + 5t - 4}{\sqrt{t}}$

$$y' = \frac{t^{1/2}(6t+5) - (3t^2+5t-4)\left(\frac{1}{2}t^{-1/2}\right)}{(\sqrt{t})^2}$$

2. The tangent line to the curve $y = f(x)$ at $P(1, 3)$ is $y = 2x + 1$. The tangent line to the curve $y = g(x)$ at $Q(1, 4)$ is $y = -x + 5$.

(a) What are $f'(1)$ and $g'(1)$? These values come from the slopes of the tangent lines; thus,

$f'(1) = 2$ and $g'(1) = -1$

(b) Let $A$ be the point on the curve $y = f(x)g(x)$ with $x$-coordinate 1. Find the $y$-coordinate of $A$.

$f(1) = 3$ and $g(1) = 4$ $\therefore$

$y = f(1)\,g(1) = 3 \cdot 4 = 12$ $A(1, 12)$.

(c) Find the equation of the tangent line to the curve $y = f(x)g(x)$ at the point $A$.

$$y' = f'(x)\,g(x) + f(x)\,g'(x)$$

$$y'(1) = f'(1)\,g(1) + f(1)\,g'(1) = 2(4) + 3(-1) = 5.$$

$(y - 12) = 5(x - 1)$ or $\boxed{y = 5x + 7}$