Handout 4: Finding derivatives using the Product and Quotient Rules

Calculate formulas for the derivatives of the functions given in the table below.

Function	***Derivative***
$f(x) = \dfrac{x}{1+x^2}$	
$f(x) = \left(x + \sqrt{x}\right) \cdot \left(1 + x^3\right)$	
$h(t) = \left(t^2 + 1\right) \cdot (t-1)^{-1}$	
$l(z) = z \cdot \left(1 + z + z^2\right)$	

$q(s) = \dfrac{s^2\left(1+\frac{1}{s}\right)}{1+s^2}$	
$u(x) = \dfrac{1+x^2+x^3}{1+9x+2x^2}$	
$v(t) = \dfrac{\sqrt[3]{t}-t}{1+t^2}$	
$m(z) = z^7 \cdot \left(3z^{1/4}+z^2\right)^{-1}$	

Answers:

(a) $f'(x) = \dfrac{\left(1+x^2\right) - 2x^2}{\left(1+x^2\right)^2}.$

(b) $f'(x) = \left(1 + \frac{1}{2}x^{-1/2}\right)\cdot\left(1+x^3\right) + \left(x + \sqrt{x}\right)\cdot\left(3x^2\right).$

(c) $h'(t) = \dfrac{2t\cdot(t-1) - \left(t^2+1\right)}{(t-1)^2}.$

(d) $l'(z) = \left(1+z+z^2\right) + z\cdot(1+2z).$

(e) $q'(s) = \dfrac{(2s+1)\cdot\left(1+s^2\right) - s^2\cdot\left(1+\frac{1}{s}\right)\cdot 2s}{\left(1+s^2\right)^2}.$

(f) $u'(x) = \dfrac{\left(2x+3x^2\right)\cdot\left(1+9x+2x^2\right) - \left(1+x^2+x^3\right)\cdot(9+4x)}{\left(1+9x+2x^2\right)^2}.$

(g) $v'(t) = \dfrac{\left(\frac{1}{3}t^{-2/3} - 1\right)\cdot\left(1+t^2\right) - \left(\sqrt[3]{t} - t\right)\cdot(2t)}{\left(1+t^2\right)^2}.$

(h) $m'(z) = \dfrac{7z^6\cdot\left(3z^{1/4}+z^2\right) - \left(\frac{3}{4}z^{-3/4}+2z\right)\cdot\left(z^7\right)}{\left(3z^{1/4}+z^2\right)^2}.$