Applying the Power Rule

Use the power rule to find the derivative of each of the following functions, first expressing it as a power function (or a multiple of a power function) if necessary.

$f(x)$	$f(x)$ expressed as a power function or multiple of a power function	$f'(x)$
Example: $f(x)=\frac{5x^6}{4}$	$\frac{5}{4}x^6$	$f'(x)=\frac{30}{4}x^5=\frac{15}{2}x^5$
1. $f(x)=\frac{x^7}{3}$		$f'(x)=$
2. $f(x)=\frac{1}{x^4}$		$f'(x)=$
3. $f(x)=\sqrt[3]{x}$		$f'(x)=$
4. $f(x)=-\frac{3}{x}$		$f'(x)=$
5. $f(x)=6\sqrt[4]{x^3}$		$f'(x)=$

Understanding Composite Functions

Each of the functions $h(x)$ given in the first column below is a composition of functions $f(g(x))$. What is the outer function $f(x)$? What is the inner function $g(x)$? Complete the table below.

$h(x) = f(g(x))$	Outer Function $f(x)$	Inner Function $g(x)$
Example: $h(x) = \sqrt{x^3 + 1}$	$f(x) = \sqrt{x}$	$g(x) = x^3 + 1$
1. $h(x) = (3 + \sin x)^5$		
2. $h(x) = \tan(3x)$		
3. $h(x) = \cos^4 x$		
4. $h(x) = e^{5x-2}$		
5. $h(x) = \ln(3x^4 + x - 5)$		

Products, Quotients, and Composite Functions

For each of the functions $f(x)$ given below, decide whether the function is a product, a quotient, or a composition of simpler functions, and then complete the second and third columns of the table.

Example: $f(x) = x^3 \sec x$ Check one: ☑ Product: $u(x) \cdot v(x)$ ☐ Quotient: $\frac{u(x)}{v(x)}$ ☐ Composition: $u(v(x))$	$u(x) = x^3$	$v(x) = \sec x$
1. $f(x) = \cos(\ln x)$ Check one: ☐ Product: $u(x) \cdot v(x)$ ☐ Quotient: $\frac{u(x)}{v(x)}$ ☐ Composition: $u(v(x))$	$u(x) =$	$v(x) =$
2. $f(x) = \tan^{-1}\left(\sqrt{x}\right)$ Check one: ☐ Product: $u(x) \cdot v(x)$ ☐ Quotient: $\frac{u(x)}{v(x)}$ ☐ Composition: $u(v(x))$	$u(x) =$	$v(x) =$
3. $f(x) = \frac{\sin x}{1 + \sin x}$ Check one: ☐ Product: $u(x) \cdot v(x)$ ☐ Quotient: $\frac{u(x)}{v(x)}$ ☐ Composition: $u(v(x))$	$u(x) =$	$v(x) =$
4. $f(x) = e^x \csc x$ Check one: ☐ Product: $u(x) \cdot v(x)$ ☐ Quotient: $\frac{u(x)}{v(x)}$ ☐ Composition: $u(v(x))$	$u(x) =$	$v(x) =$

5. $f(x) = e^{\sin^{-1} x}$ Check one: ☐ Product: $u(x) \cdot v(x)$ ☐ Quotient: $\frac{u(x)}{v(x)}$ ☐ Composition: $u(v(x))$	$u(x) =$	$v(x) =$
6. $f(x) = \frac{3^x}{3^x + x}$ Check one: ☐ Product: $u(x) \cdot v(x)$ ☐ Quotient: $\frac{u(x)}{v(x)}$ ☐ Composition: $u(v(x))$	$u(x) =$	$v(x) =$
7. $f(x) = \sqrt[3]{x} \ln x$ Check one: ☐ Product: $u(x) \cdot v(x)$ ☐ Quotient: $\frac{u(x)}{v(x)}$ ☐ Composition: $u(v(x))$	$u(x) =$	$v(x) =$