

Section 1.3 Supplemental Material

In math 160, it is important for you to be able to manipulate exponents quickly and easily. It is essential to be able to write functions using properties of exponents.

Properties:

1. $\frac{1}{x^n} = x^{-n}$

Example: If $f(x) = \frac{1}{x^{3/4}}$ then we can use property 1 to rewrite as $f(x) = x^{-3/4}$

2. $\sqrt[n]{x} = x^{1/n}$

Example: If $f(x) = \sqrt{x} - \sqrt[4]{x} + \frac{1}{\sqrt[3]{x}}$, then we can use property 2 and rewrite as $f(x) = x^{1/2} - x^{1/4} + x^{-1/3}$

The Power Rule:

Let r be any real number and let $f(x) = x^r$. Then $f'(x) = rx^{r-1}$.

Note: The derivative of a constant is 0. (If $f(x) = k$ where k is a constant, then $f'(x) = 0$.)

For each of the following functions, a) Rewrite the function as a power using property 1 and 2. b) Use the Power rule to find $f'(x)$.

1. $f(x) = \frac{3}{x}$

2. $f(x) = 2 - \sqrt{x} + \frac{5}{\sqrt[4]{x}}$

3. $f(x) = x^{5/3} - \frac{1}{x^{3/5}} + 9$

Answers: 1 a) $f(x) = 3x^{-1}$

b) $f'(x) = -3x^{-2} = \frac{-3}{x^2}$

2 a) $f(x) = 2 - x^{1/2} + 5x^{-1/4}$

b) $f'(x) = -\frac{1}{2}x^{-1/2} - \frac{5}{4}x^{-5/4} = -\frac{1}{2\sqrt{x}} - \frac{5}{4x^{5/4}}$

3 a) $f(x) = x^{5/3} - x^{-3/5} + 9$

b) $f'(x) = \frac{5}{3}x^{2/3} + \frac{3}{5}x^{-8/5} = \frac{5}{3}x^{2/3} + \frac{3}{5x^{8/5}}$