Section 3.4: The Chain Rule

# Topic 1: Composite Functions

A function *m* is a **composition of functions** *f* and *g* if .

In this case *m* is called a **composite function**. The domain of *m* is the set of all real numbers such that *x* is in the domain of *g* and  is in the domain of *f.*

# Topic 2: General Power Rule

If  is a differentiable function, *n* is any real number, and , then

.

It can also be written  or .

**Topic 3: The Chain Rule**

If $y=f(u) $and $u=g\left(x\right)$ define a composite function $y=m\left(x\right)=f[g\left(x\right)]$, then

$$m^{'}(x)=f^{'}[g\left(x\right)] g^{'}\left(x\right)$$

provided that $f^{'}[g\left(x\right)]$ and $ g^{'}\left(x\right)$ exist.

Equivalently, if $y=f(u) $and $u=g\left(x\right) $define a composite function $y=m\left(x\right)=f[g\left(x\right)]$, then

$$\frac{dy}{dx}=\frac{dy}{du}\frac{du}{dx}$$

provided that $\frac{dy}{du}$ and $\frac{du}{dx}$ exist.