1 3.5: Chain Rule

From 3.4: we know $\frac{d}{dx}(\sin x) = \cos x$. Does $\frac{d}{dx}(\sin 2x) = \cos 2x$?

Recall: The **composition** of 2 functions f and g is defined by

Define f and g for the above function.

The Chain Rule: If f and g are differentiable functions, $y = f(u)$ and $u = g(x)$, then

$\frac{dy}{dx} =$

An alternate version of the Chain Rule states that $\frac{d}{dx} f(g(x)) =$

Examples:

Find the derivatives of the following:

$f(x) = \sin(x^2) - \sin^3 x$

$y = \sqrt{\cos^2(3x) + 1}$

Differentiate the following:

$f(x) = x^2 \tan(3x)$

$y = \dfrac{2x+1}{\sin^2 x}$

(On Your Own) Given $f(1) = 2$, $f(2) = 2\sqrt{2}$, $f'(1) = 1$, $f'(2) = \dfrac{1}{2}$, $g(1) = 2$, $g(2) = \dfrac{5}{2}$, $g'(1) = \dfrac{3}{4}$, $g'(2) = 0$, and $u(x) = f(g(x))$, find $u'(1)$

$(\dfrac{3}{8})$