Recall:

1. Find the derivative for the following functions:

   a. $\sin x$

   b. $x^2 - 4$

What about $\sin(x^2 - 4)$?

Finding Chain Rule:

1. $y = 6x - 10$

2. $y = 9x^4 + 6x^2 + 1$

RULE 8 The Chain Rule

If f is differentiable at the point $u = g(x)$, and g is differentiable at x, then the composite function $(f \circ g)(x) = f(g(x))$ is differentiable at x, and

$$(f \circ g)'(x) = f'(g(x)) \cdot g'(x).$$

In Leibniz notation, if $y = f(u)$ and $u = g(x)$, then

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

where dy/du is evaluated at $u = g(x)$.

1. Find the derivative of the following:

   a. $y = \sin(x^2 + x)$

   b. $y = \cos(3x + \pi)$

   c. $y = \tan(2x - x^3)$

d. $y = 5\cot\left(\frac{2}{x}\right)$

e. $y = \sec(\tan x)$

f. $y = (\csc x + \cot x)^{-1}$

g. $y = x^3 (2x-5)^4$

h. $y = 4\sqrt{\sec x + \tan x}$

i. $y = \dfrac{x}{\sqrt{1+x^2}}$

j. $y = (1 + \cos 2x)^2$

k. $y = \sec(2x)\tan(2x)$

l. $y = 2x\sqrt{\sec x}$

m. $y = 9\tan\left(\frac{x}{3}\right)$