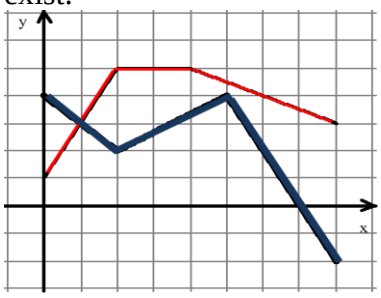
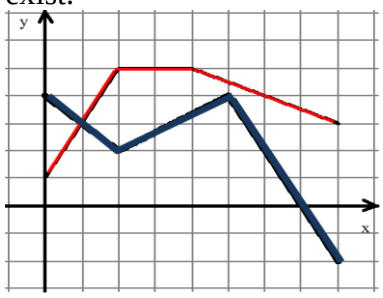
§2.4: The Chain Rule
"I WILL…
… Apply a derivative using the Chain Rule"

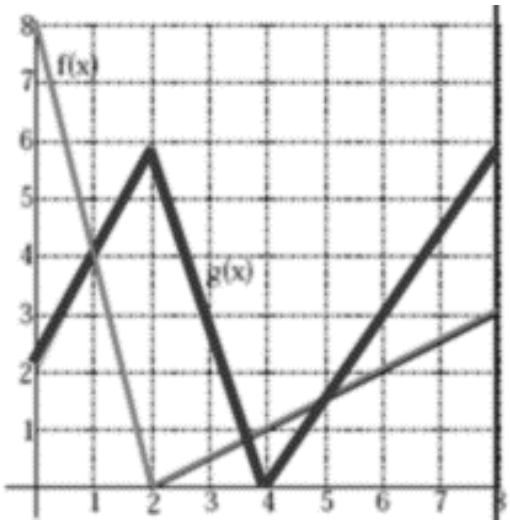
I. Chain Rule

A. $\frac{d}{dx}[f(g(x))] =$ _____

B. If $f(x)$ is a differentiable function and $g(x)$ is a differentiable function, then $y = f(g(x))$ is a differentiable function.

Ex 1: Solve $\frac{dy}{dx}$ for $y = (x^2 + 1)^3$	Ex 2: Solve $\frac{dy}{dx}$ for $f(x) = (2x^2 + 5)^7$
Ex 3: Solve $\frac{dy}{dx}$ for $f(x) = \sqrt{x^2 + 1}$	Your Turn: Solve $\frac{dy}{dx}$ for $f(x) = (2x^3 + 1)^{10}$
Ex 4: Solve $g'(t)$ for $g(t) = \frac{1}{3t^2+4}$	Your Turn: Solve $f'(x)$ for $f(x) = \frac{-7}{(2t-3)^2}$
Ex 5: Use the graphs of f (red graph) and g (blue graph) to solve for $h'(7)$ if $h(x) = g(f(x))$, if they exist. 	Ex 6: Use the graphs of f (red graph) and g (blue graph) to solve for $p'(6)$ if $p(x) = g(f(x))$, if they exist. 

Your Turn: Use the graphs of f (red graph) and g (blue graph) to solve for $u'(6)$ if $u(x) = f(g(x))$, if they exist.



Ex 7: Solve y' *for* $y = \sin(2x + 3)$

Ex 8: Solve y' for $y = \tan^2 x$

Ex 9: Solve y' for $y = \csc(x^3)$

Your Turn: Solve y' for $y = \cos(3x)^2$

Ex 10: Solve $\frac{dy}{dx}$ for $y = \sin^3(4x)$

Ex 11: Solve $\frac{dy}{dx}$ for $f(x) = 3\cos^3(x^3 + 1)$	Your Turn: Find $\frac{dy}{dx}$ for $f(x) = 4\sec^3(2x + 1)$
Ex 12: Solve $f''(x)$ for $f(x) = x^4 \sin x$	Your Turn: Solve $f'(x)$ for $f(x) = \frac{-2x^2-5}{\cos(2x^3)}$
Ex 13: If $y = \tan u$, $u = v - \frac{1}{v}$, and $v = \ln x$ what is the value of $\frac{dy}{dx}$ at $x = e$?	Ex 14: Determine the point(s) in the interval of $(0,2\pi)$ at which the graph of $f(x) = \frac{\cos x}{2+\sin x}$ has a horizontal tangent.

Your Turn: Determine the equation of the tangent line using the equation, $y = \frac{1}{x} + \sqrt{\cos x}$ at $(\pi, 1)$.

AP 1) Find the derivative of $s(t) = \sec\sqrt{t}$

(A) $\sec\frac{1}{2\sqrt{t}}\tan\frac{1}{2\sqrt{t}}$ (B) $\sec\sqrt{t}\tan\sqrt{t}$ (C) $\frac{\sec\sqrt{t}\tan\sqrt{t}}{2\sqrt{t}}$ (D) $\tan^2\sqrt{t}$

Vocabulary	Connections and Process	Answer and Justifications

AP 2) Find the derivative of $f(\theta) = \sqrt{\sin 2\theta}$

(A) $\frac{\cos 2\theta}{\sqrt{\sin 2\theta}}$ (B) $\frac{\cos 2\theta}{2\sqrt{\sin 2\theta}}$ (C) $\cos 2\theta$ (D) $\sqrt{\sec 2\theta}$

Vocabulary	Connections and Process	Answer and Justifications

Assignment: Page 136: 7-31 odd, 43-57 odd, 65-71 odd, 84, 85, 87, 102