Unit 3 – Composite Derivative Rules

Chain Rule:

Power Rule, a & n constant. $\frac{d}{dx}[au^n]$	Exponential Function, base e. $\frac{d}{dx}[e^u]$	Exponential function, base a. $\frac{d}{dx}[a^u]$
$\frac{d}{dx}[\sin u]$	$\frac{d}{dx}[\cos u]$	$\frac{d}{dx}[\tan u]$
$\frac{d}{dx}[\sec u]$	$\frac{d}{dx}[\csc u]$	$\frac{d}{dx}[\cot u]$

Implicit Differentiation:

1. Find $\frac{dy}{dx}$ given $x^2 - 3xy + 4y^5 = 100$.

2. Find $\frac{d^2B}{dt^2}$ in terms of B given $\frac{dB}{dt} = 6\sqrt{10 - B}$.

Derivatives of Inverse Functions:

If $h(x)$ and $g(x)$ are inverses, then $h\big(g(x)\big) = x$. What happens when we differentiate that equation?

1. Given that $p(x) = \sqrt[3]{2x-1}$ find $[p^{-1}]'(5)$.

2. The function $f(x)$ is an increasing function about which little else is known other than $f(2) = 7$ and $f'(2) = 5$. Find $(f^{-1})'(7)$

More derivatives to have on quick recall in your brain!

$\frac{d}{dx}[\ln u]$	$\frac{d}{dx}\left[\frac{1}{u}\right]$	$\frac{d}{dx}[\sqrt{u}]$
$\frac{d}{dx}[\arcsin u]$	$\frac{d}{dx}[\cos^{-1} u]$	$\frac{d}{dx}[\arctan u]$

Derivative Rules: Level 2

Analytical

$$\frac{1}{2}x^2 - \frac{1}{2}xy^2 + 6y = 2x$$

Find $\frac{dy}{dx}$ when $x = 4$

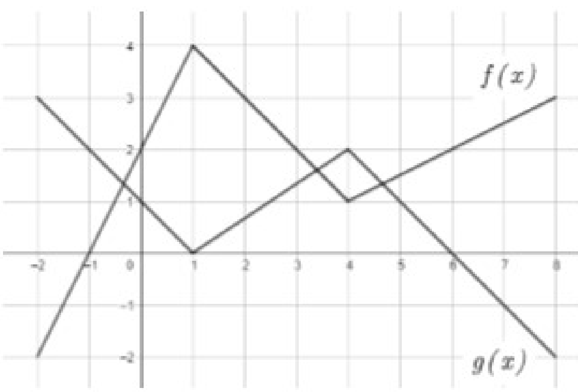
Numerical

x	-1	0	2	5
$f(x)$	0	2	5	4
$f'(x)$	-3	4	1	-2

$$g(x) = f(f(x))$$

$$g'(-1) =$$

Graphical



$$h(x) = g(f(x))$$
$$h'(2) =$$

Conceptual/Verbal

g is a linear function with $g(3) = g'(3) = 4$

$$k(x) = \frac{g(x)}{g(x+2)}$$

$$k'(3) =$$