

Calculus 2 Non-assignment 0 Solutions Spring'07

1 (a) $\lim_{k \rightarrow 1} \frac{k^2 + k - 2}{k^2 - 1}$ Substitution fails, giving "0/0",
so simplify or use l'Hôpital's rule.
Simplifying gives

$$\lim_{k \rightarrow 1} \frac{(k-1)(k+2)}{(k-1)(k+1)}$$

$$= \lim_{k \rightarrow 1} \frac{k+2}{k+1} = \frac{1+2}{1+1} = \underline{\underline{3/2}}$$

(b) The laws of limits give $\lim_{x \rightarrow c} (f(x) + 3g(x))$
 $= \lim_{x \rightarrow c} f(x) + 3 \lim_{x \rightarrow c} g(x)$
 $= 5 + 3(-2) = \underline{\underline{-1}}$

2 (a) $y = cf(x)$, $y' = cf'(x)$ [product with constant factor]

(b) $y = f(x) \cdot g(x)$, $y' = f'(x) \cdot g(x) + f(x)g'(x)$
[product of functions]

(c) $y = f(x)/g(x)$ $y' = \frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2}$
[quotient rule]

(d) $y = f(g(x))$, $y' = f'(g(x)) \cdot g'(x)$ (Chain Rule)

(e) $y = x^2 \sin x$, $y' = 2x \sin x + x^2 \cos x$

(f) $y = \frac{2x+5}{3x-2} = \frac{(2x+5)'(3x-2) - (2x+5)(3x-2)'}{(3x-2)^2} \dots$