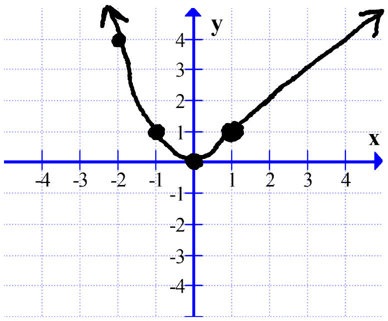
C12 - 2.6 - Piece/Find k Derivatives Notes

$f(x) = \begin{cases} x^2 ; & x < 1 \\ x ; & x \geq 1 \end{cases}$



$f'(x) = \lim_{h \to 0^-} \frac{f(x+h) - f(x)}{h} = 2$

≠ Not Differentiable

$f'(x) = \lim_{h \to 0^+} \frac{f(x+h) - f(x)}{h} = 1$

$f(x) = x^2$

$\lim_{h \to 0^-} \frac{f(x+h) - f(x)}{h}$

$\lim_{h \to 0^-} \frac{(x+h)^2 - (x^2)}{h}$

$\lim_{h \to 0^-} \frac{x^2 + 2xh + h^2 - x^2}{h}$

$\lim_{h \to 0^-} \frac{2xh + h^2}{h}$

$\lim_{h \to 0^-} \frac{h(2x+h)}{h}$

$\lim_{h \to 0^-} 2x + h$

$f'(x) = 2x$

$m = f'(1) = 2(1) \quad x = 1$

$m = f'(1) = 2$

$f(x) = x^2$

$f'(x) = 2x$

$f'(1) = 2(1)$

$f'(2) = 2^*$

$f(x) = x$

$\lim_{h \to 0^+} \frac{f(x+h) - f(x)}{h}$

$\lim_{h \to 0^+} \frac{(x+h) - (x)}{h}$

$\lim_{h \to 0^+} \frac{h}{h}$

$f'(x) = 1$

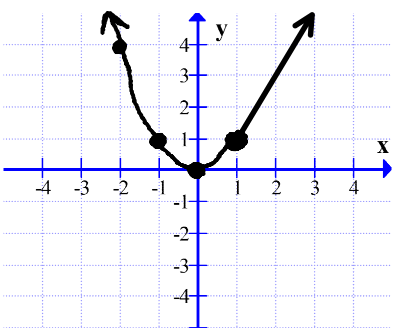
$y = mx + b$

$f(x) = x$

$f'(x) = 1$

$f'(1) = 1^*$

$f(x) = \begin{cases} x^2 ; & x < 1 \\ 2x - 1 ; & x \geq 1 \end{cases}$



$f'(x) = \lim_{h \to 0^-} \frac{f(x+h) - f(x)}{h} = 2$

= Differentiable

$f'(x) = \lim_{h \to 0^+} \frac{f(x+h) - f(x)}{h} = 2$

$f(x) = 2x - 1$

$\lim_{h \to 0^+} \frac{f(x+h) - f(x)}{h}$

$\lim_{h \to 0^+} \frac{2(x+h) - 1 - (2x-1)}{h}$

$\lim_{h \to 0^+} \frac{2x + 2h - 1 - 2x + 1}{h}$

$\frac{2h}{h}$

$f'(x) = 2$

$y = mx + b$

$f(x) = 2x - 1$

$f'(x) = 2$

$f'(1) = 2^*$

Find k so differentiable.

$f(x) = \begin{cases} 2x - k ; x \geq 1 \\ x^2 \quad ; x < 1 \end{cases}$

$2x - k = x^2$

$2(1) - k = (1)^2$

$2 - k = 1$

$k = 1$

Sub x value
and equate

Take derivatives
Sub x and equate

$f(x) = 2x - k$

$f'(x) = 2$

$f'(2) = 2$

$2 = 2$

Nothing to solve for.

$f(x) = x^2$

$f'(x) = 2x$

$f'(1) = 2(1)$

$f'(1) = 2$