Ch. 2 Review (Differentiable Piecewise Functions)

Finding Constants to make a Piecewise Function continuous and differentiable.

2. How to find constants a *and* b so that the function is continuous and differentiable.
   a. You will be given a function like this one:

$$f(x) = \begin{cases} ax + 3 & x \leq 1 \\ 3x^2 + x + b & x > 1 \end{cases}$$

3. Practice find constants a and b so that the function is continuous and differentiable.

   a. $f(x) = \begin{cases} 2x^2 + 2x + a & x \leq -1 \\ -2bx + 1 & x > -1 \end{cases}$

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2. **How to find constants *a and b* so that the function is continuous and differentiable.**
   a. **You will be given a function like this one:**

$$f(x)=\begin{cases} ax+3 & x\le 1 \\ 3x^2+x+b & x>1 \end{cases}$$

Continuous - share same y-value (set equations equal) at $x=1$

$ax+3=3x^2+x+b$

$a(1)+3=3(1)^2+1+b$

$a+3=4+b$

$a=1+b$

$7=1+b$

$6=b$

differentiable - share same slope (set derivatives equal) at $x=1$

$$f'(x)=\begin{cases} a, & x\le 1 \\ 6x+1, & x<1 \end{cases}$$

$a=6x+1$

$a=6(1)+1$

$a=7$

3. **Practice find constants a and b so that the function is continuous and differentiable.**

   a. $$f(x)=\begin{cases} 2x^2+2x+a & x\le -1 \\ -2bx+1 & x>-1 \end{cases}$$

Continuous (at $x=-1$)

$2x^2+2x+a=-2bx+1$

$2(-1)^2+2(-1)+a=-2b(-1)+1$

$a=2b+1$

$a=2(1)+1$

$a=3$

differentiable at $x=-1$

$$f'(x)=\begin{cases} 4x+2 & x\le -1 \\ -2b & x>-1 \end{cases}$$

$4x+2=-2b$

$4(-1)+2=-2b$

$-2=-2b$

$1=b$