Chapter 1, Section 4: Preview Activity

Preview Activity 1.4.1. Consider the function $f(x) = 4x - x^2$.

a. Use the limit definition to compute the derivative values: $f'(0)$, $f'(1)$, $f'(2)$, and $f'(3)$.

b. Observe that the work to find $f'(a)$ is the same, regardless of the value of a. Based on your work in (a), what do you conjecture is the value of $f'(4)$? How about $f'(5)$? (Note: you should *not* use the limit definition of the derivative to find either value.)

c. Conjecture a formula for $f'(a)$ that depends only on the value a. That is, in the same way that we have a formula for $f(x)$ (recall $f(x) = 4x - x^2$), see if you can use your work above to guess a formula for $f'(a)$ in terms of a.

a. Use the limit definition to compute the derivative values: f'(0), f'(1), f'(2), and f'(3).

In[20]:=
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f[x_] := 4 x - x^2
Simplify[(f[a + h] - f[a]) / h]
TableForm[{{"a", "f'(a)"}, {0, f'[0]}, {1, f'[1]}, {2, f'[2]}, {3, f'[3]}}]
```

Out[21]= $4 - 2a - h$

Out[22]//TableForm=

a	f'(a)
0	4
1	2
2	0
3	-2

Observe that the work to find f’(a) is the same, regardless of the value of a. Based on your work in (a), what do you conjecture is the value of f’(4)? How about f’(5)? (Note: you should not use the limit definition of the derivative to find either value.)

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Simplify[(f[a + h] - f[a]) / h]
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Out[13]= $4 - 2a - h$

If a=4, -4; if a=5, -6. 4-2a is the formula, whatever the a. In other words, it’s a linear function of a..

Conjecture a formula for f’(a) that depends only on the value a. That is, in the same way that we have a formula for f(x) (recall f(x)=4x–x^2), see if you can use your work above to guess a formula for f’(a) in terms of a.

f'(a) = 4-2a