Common Calculus Mistakes
Product Rule: Constants

The Goal

Find

$$\frac{d}{dr}2r\left(200-\frac{1}{2}r^2\pi\right)$$

The Mistake

Find the mistake:

$$\frac{d}{dr}2r\left(200-\frac{1}{2}r^2\pi\right)=2r(200-r\pi)+\left(200-\frac{1}{2}r^2\pi\right)2$$

Need a hint? Look carefully at the red part:

$$\frac{d}{dr}2r\left(200-\frac{1}{2}r^2\pi\right)=2r(200-r\pi)+\left(200-\frac{1}{2}r^2\pi\right)2$$

The Correction

$$\frac{d}{dr}2r\left(200-\frac{1}{2}r^2\pi\right)=2r(0-r\pi)+\left(200-\frac{1}{2}r^2\pi\right)2$$

$$=-2\pi r^2+400-\pi r^2=400-3\pi r^2$$

An Explanation

In the second factor the constant 200 has derivative 0, but the student left the 200 in place, perhaps distracted by differentiating the following term $(1/2)r^2\pi$.

This derivative is easier to compute by multiplying out the expression to be differentiated first and then taking the derivative *without* using the product rule.