(#10) What is the minimum possible sum of a number and twice its square?

Solution:

Let x represent the number, let R represent the result of adding then

$$R = x + 2x^2$$

$$R = 2x^2 + x$$

$$R = 2\left(x^2 + \frac{1}{2}x\right)$$

$$R = 2\left(x^2 + \frac{1}{2}x + \left(\frac{1}{4}\right)^2 - \left(\frac{1}{4}\right)^2\right) = 2\left(x^2 + \frac{1}{2}x + \frac{1}{16}\right) - 2\left(\frac{1}{16}\right)$$

$$R = 2\left(x^2 + \frac{1}{2}x + \frac{1}{16}\right) - \frac{1}{8}$$

$$R = 2\left(x + \frac{1}{4}\right)^2 - \frac{1}{8}$$

$a = 2 > 0$, $\cup$, The minimum value of R is $-\frac{1}{8}$

when $x = -\frac{1}{4}$