Problem:

Investigate linear dependence for the following system of functions: $x, 2x, x^2$.

Solution:

$y_1 = x, y_2 = 2x, y_3 = x^2$.

Using the definition of linear dependence, let's write:

$\alpha_1 y_1 + \alpha_2 y_2 + \alpha_3 y_3 \equiv 0, x \in (-\infty, +\infty) \Rightarrow \alpha_1 x + \alpha_2 \cdot 2x + \alpha_3 x^2 = 0 \Rightarrow \alpha_1 = \alpha_2 = \alpha_3 = 0$

(a non-zero polynomial of the 2nd degree has at most 2 real zeros).

Answer: linearly independent.