The regular price of a ticket on a FLuffy Kitty Cruise Lines is $990 per person. Each cruise ship can hold at most 150 passengers. They are running a promotion this month for each confirmed reservation everyone gets $5 off their total ticket price. For example if 10 people make reservations the discounted ticket price will be $950 each. How many reservations should Fluffy Kitty Cruise Lines take to maximize their profit?

Solution:

Denote x as value of reservations. Then profit function is

$$f(x) = (990 - 5x)x, \;\; x \in [0; 150].$$

So

$$f'(x) = 990 - 10x = 0,$$

$$10x = 990,$$

$$x = 99.$$

We have

$$f(0) = 0;$$

$$f(150) = (990 - 750) \cdot 150 = 36000;$$

$$f(99) = (990 - 495) \cdot 99 = 49005.$$

Thus

$$f_{max} = f(99) = 49005$$

and

$$x_{max} = 99 \text{ (reservations)}.$$

Answer:

$$99 \quad \text{reservations}$$