Quiz 1: Solutions

Name: _____KEY_____

1. A real-estate firm owns the upscale Parkvale Avenue Apartments, which consist of 100 apartments. At $700 per month, every apartment can be rented out. However, for each $50 per month increase in rent, there will be 2 new vacancies with no possibility of filling them. The firm wants to receive exactly $102,000 per month from rent. What rent should be charged for each apartment?

Let n denote the number of $50 increases the firm needs over the base rent of $700 per month to make their target revenue of $102,000 per month. Then the total number of vacancies is $2n$, which means that $100 - 2n$ apartments will be rented. Each of them will pay $700 + 50n$ dollars per month for rent, so the total revenue for the firm is

$$(100 - 2n)(700 + 50n) = 70000 + 3600n - 100n^2.$$

Since the total revenue is supposed to be $102,000 we must have

$$70000 + 3600n - 100n^2 = 102000.$$

Simplifying this, we find

$$n^2 - 36n + 320 = 0.$$

By the quadratic formula, we deduce that

$$\begin{aligned} n &= \frac{36 \pm \sqrt{36^2 - 4 \times 320}}{2} \\ &= \frac{36 \pm 4}{2} \\ &= 16 \text{ or } 20. \end{aligned}$$

Thus to attain their target revenue, the firm should charge

$$700 + 50 \times 16 = 1500$$

or

$$700 + 50 \times 20 = 1700$$

dollars per month for rent.

---

2. Find the domain of each function.

(a) $f(x) = \dfrac{x+1}{x^2 - 3x + 2}$

> The domain is the set of all real numbers x for which $f(x)$ is well-defined. This will not be the case only for those x which make the denominator 0. Since $x^2 - 3x + 2 = (x-1)(x-2)$ we see that the domain is
> $$\{x \neq 1, 2\}.$$

(b) $g(x) = \sqrt{3x - 2}$

> In this case, the only 'bad' choices of x are those which make $3x - 2$ negative. It follows that the domain is the set of all x for which $3x - 2 \geq 0$ or in other words,
> $$\left\{x \geq \frac{2}{3}\right\}.$$