Quiz 1
Ch. 1, 2

Name: ____________________________

1. Consider the function

$$f(x) = \begin{cases} x^2 - 10, & x < 12 \\ x + 7, & x \geq 12. \end{cases}$$

   (a) [2 pts] Evaluate $f(12)$. $f(12) = 12 + 7 = 19.$

   (b) [3 pts] Solve the equation $f(x) = 9$. The first equation says $x^2 - 10 = 9$, or $x^2 = 19$. This gives $x = \pm\sqrt{19} \approx \pm 4.36$. Both of these numbers are less than 12, so $f(\pm\sqrt{19}) = 9$, as desired.

   The first equation says $x + 7 = 9$, so $x = 2$. But $2 < 12$, so $f(2) \neq 9$. Thus, the solutions are only $\pm\sqrt{19}$.

2. [3 pts] Newton's law of gravitation (which has since been replaced by Einstein's theory) says that the gravitational force F (in Newtons) between two objects is inversely proportional to the square of the distance r (in meters) between the objects. Write down a formula that relates these two quantities. (You do not need to find the constant of proportionality.)

$$F = \frac{k}{r^2}$$

3. Bob owns a burger store with his wife, Linda. When he opens in the morning, a customer walks in and immediately buys 10 burgers for a party. Afterwards, Bob sells about 15 burgers for each hour he remains open.

   (a) [3 pts] Write down a model (*i.e.* an equation) for the number of burgers, B, that bob sells, as a function of time, t, in hours since he opens. The y-intercept should be 10, while the slope we can read off is 15 burgers per hour. So,

   $$B(t) = 10 + 15t.$$

   (b) [3 pts] According to this model, when will Bob sell 160 burgers? Solve the equation $B(t) = 160$:

   $$\begin{aligned} 160 &= 15t + 10 \\ 150 &= 15t \\ t &= 10 \text{ hours.} \end{aligned}$$

   (c) [2 pts] Bob only prepared enough ingredients to sell exactly 160 burgers for today. What is the practical domain for the function $B(t)$ in part (a)? We should assume that Bob closes after he sells his 160 burgers. Thus, the practical domain is $[0, 10]$.

4. [4 pts] Find the largest possible domain of the function

   $$g(x) = \frac{1}{\sqrt{-x}}.$$

   Be sure to express your answer in both set notation and interval notation.

   $$\mathrm{Dom}(g) = \{x \mid x < 0\} = (-\infty, 0)$$