3. (6 points) A group of researchers in Costa Rica is studying the number of resplendent quetzals (these are birds) that nest in Monteverde Cloud Forest Preserve each year. The function f gives the number of quetzals the researchers count in the park on day t. Write an expression involving f that models each of the situations (a)-(c) below.

(a) After determining $f(t)$, the researchers discover they forgot to include an area of the park that houses 50 quetzals year round. Write an expression representing the number of quetzals the researchers should use for their count.

The appropriate number of quetzals $= f(t) + 50$.

(b) The number of visitors to the park is a function of the number of quetzals in the park. Suppose the function is given by $g(q)$ where q is the number of quetzals in the park. Write an expression that gives the number of visitors to the park on day t, based on the information that the researchers have.

The number of visitors to the park on day $t = g(f(t) + 50)$.

(c) The researchers discover another sloppy calculation. They had speculated that on day T they would count the maximum number of quetzals. They found that the maximum quetzal count actually took place in the park 5 days earlier than they had anticipated. Find a formula for the maximum count, M, in terms of day T.

$$M = f(T - 5) + 50$$

4. (4 points) The volume of a cylinder of radius r and height h is given by $V = \pi r^2 h$. If 6 times the height plus 2 times the radius must equal 36, determine a formula for the volume of the cylinder in terms of the radius.

The conditions given tell us that $6h + 2r = 36$. Since we want the formula for the volume of the cylinder in terms of the radius, we need to eliminate h. Therefore, we solve $6h + 2r = 36$ for h, obtaining $h = 6 - \frac{1}{3}r$. Now we plug this back into the given formula for V and get

$$V = \pi r^2 (6 - \frac{1}{3}r).$$