

1. **(6 points)** Predator-prey interactions are subject to periodic behaviors and can be modeled by *trigonometric functions*. In a town infested by zombies, the human population is observed to oscillate over a period of ten years. Currently, the human population is at its peak value of 60000; at the lowest point of the cycle the population is 40000. Construct a function $f(t)$ to model the human population t years from now.

2. **(6 points)** Identify the domains of the following functions:
 - (a) **(3 points)** $g(x) = \sqrt{x+4} - 3$.

 - (b) **(3 points)** $f(x) = \frac{x^2-1}{(2x+3)(x-1)}$.

3. **(8 points)** The drug hypercortisone-D has a half-life of 3 hours (so, after 3 hours, half the quantity in a user's system has been eliminated). Quentin Quire has just taken a 200mg dose.
 - (a) **(4 points)** Construct a function $f(t)$ to describe the quantity of the drug in his system after t hours.

 - (b) **(4 points)** Use your function to determine when only 5mg of the drug remain. Your answer should be in the simplest calculatable form.

4. **(2 point bonus)** If $f(x)$ is an odd function, what can then be said about $f^{-1}(x)$, and why? What about when $f(x)$ is even? Work on the back of this sheet if necessary.