Read 2.0-2.5 then do each of the following problems. Problems in parenthesis are not assigned, but offer great applications of the material we are covering.
1.) Section 2.1 # 1, 2
2.) Section 2.2 # 2, 8, 9, 10 (13)
3.) Section 2.4 # 4 (9)
4.) Section 2.5 # 1, 5b (6)
5.) Consider the differential equation

\[ \dot{x} = \sin^2 \left( \frac{n\pi}{x} \right) + \sin^2(\pi x) \]

where \( n \) is a positive integer. For this problem, we assume that \( x > 0 \) as the right hand side of (1) is non negative (thus if \( x(0) > 0 \) then \( x(t) > 0 \) for all \( t \)).
(a) Graph the vector field in (1), with \( n = 6 \) and \( 1 \leq x \leq 7 \)
(b) What are the fixed points of (1) with \( n = 6 \)? Classify them in terms of their stability.
(c) For a general positive integer \( n \), what are the fixed points of (1)?
(d) Let \( n > 2 \) be a given positive integer. Suppose the trajectory of (1) starting at \( x(0) = 2 \) satisfies

\[ \lim_{t \to \infty} x(t) = n. \]

What kind of number is it?