1. Complete each exercise for the functions f and g where they are defined by

$$f(x) = 3x^2 + 4x - 4 \text{ and } g(x) = 14 - 3x - 5x^2.$$

   (a) Do each of the following.

        i. Define each of the functions f and g.

        ii. Define a function for the sum of f and g. Evaluate.

        iii. Define a function for the quotient of f and g where g is the divisor. Evaluate and simplify.

        iv. Define a function for the composition $f \circ g$. Evaluate and simplify.

   (b) Find the **exact value** of f, g, the sum, the quotient, and the composition when $x = 3\sqrt{2}$. *Simplify all of the answers.*

   (c) Evaluate $f(x^2)$, $g(2t + 3)$, and $f(a + h)$. *Simplify each.*

   (d) Graph both f and g on the same coordinate plane where $x \in [-3, 2]$. Use standard (normal) crossed axes, make each curve a *different* solid color, show gridlines, show a title and legend, use the function names in the legend, and make the coordinate plane as wide as the display. Also, use the **Point Probe** to *estimate* the intersection points of the graph (state the intersection points in a sentence).

   (e) Evaluate each of the following limits.

        i. $\displaystyle \lim_{x \to 0} \frac{f(x)}{g(x)}$

        ii. $\displaystyle \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$

2. The 2008 Minnesota State Income Tax Schedule for the filing status of Married filing jointly or Qualifying widow(er):

Taxable income is over	But not over	Amount of Tax	Of the amount over
$0	$31,860	5.35%	$0
$31,860	$126,580	$1,704.51 + 7.05%	$31,860
$126,580	or over	$8,382.27 + 7.85%	$126,580

   (a) Define the tax function in terms of a piecewise defined function. Use 'Tax' for the function name.
   Did you consider negative income?

   (b) Find the amount of tax owed on taxable income of $15,000, $50,000, and $150,000. Show the results in *normal notation for a dollar amount.*

   (c) Graph the tax function with an appropriate scale, label the axes, and title the graph. Use boxed axes, *show at least some negative income*, and choose an appropriate maximum income.

   (d) How many line segments are there in the graph? What does the slope of each line segment represent?

   (e) Use a matrix to create a tax table from $10,000 to $150,000 with increments of $10,000. The first column should be the taxable income and the second column should be the tax.

3. The voltage V produced by an AC generator is

$$V = 220 \sin(120\pi t).$$

(a) *Approximate* the voltage for $t = 1/240$.

(b) Use a matrix to create a table approximating the voltage to five decimal places for the times $t = 0.001, 0.002, 0.003, \ldots, 0.01$. The first column should contain the times and the second column the corresponding voltages.

(c) Graph the voltage function for the interval $t \in [0, 0.25]$. Show a title and axes labels.