College of the Redwoods
Mathematics Department
Math 105 — Elementary Algebra

Exam #2
Review Questions

David Arnold

Last Revision Date: October 2, 2003

Essay Questions

Instructions: *Place the solution to each exercise on a* separate *sheet of paper.*

EXERCISE 1. For each of the following equations, without the use of a calulator, set up a table of points that satisfy the given equation. Set up a coordinate system on a sheet of graph paper, label and scale each axis, then plot the points from your table. Finally, make "a leap of faith" and plot *all* points that satisfy the given equation; i.e., plot the graph of the given equation.

(a) $y = 2x + 3$
(b) $y = 3 - 5x$
(c) $y = x^2 + 4$
(d) $y = (x + 4)^2$
(e) $y = |x - 1|$
(f) $y = |x| + 3$
(g) $y = \sqrt{x - 2}$
(h) $y = \sqrt{x} + 3$

EXERCISE 2. Consider the equation

$$y = |14 - 3x - x^2|.$$

Enter the equation into your calculator, then use the table feature of your calculator to complete the following table of points that satisfy the given equation.

x	-10	-8	-6	-4	-2	0	2	4	6	8	10	12	14	16	18
y															

Set up a coordinate system on a sheet of graph paper, label and scale each axis, then plot each of the points from your table. Finally, plot *all* the points that satisfy the given equation; i.e., plot the graph of the given equation.

EXERCISE 3. Consider the equation

$$y = |x^3 - 3x^2 - 40x|.$$

Enter the equation into your calculator, then use the table feature of your calculator to complete the following table of points that satisfy the given equation.

x	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
y																		

Set up a coordinate system on a sheet of graph paper, label and scale each axis, then plot each of the points from your table. Finally, plot *all* the points that satisfy the given equation; i.e., plot the graph of the given equation.

EXERCISE 4. Use a graphing calculator to plot the graph of each of the following equations. Adjust your viewing window to show all important features of the graph, such as "turning points" and points where the graph crosses the x-axis (x-intercepts). Copy the image from your viewscreen to your examination paper. Label each axis, then scale each axis by indicating the value of xmin, xmax, ymin, and ymax at the end of each axis.

(a) $y = 1.25x - 50$
(b) $y = 400 - 1.24x$
(c) $y = x^2 - 8x - 64$
(d) $y = 3x^2 - x - 144$
(e) $y = |x^2 - 2x - 3|$
(f) $y = |44 - 3x - x^2|$
(g) $y = \sqrt{12 - x}$
(h) $y = \sqrt{2x + 35}$

EXERCISE 5. For each of the following equations, perform each of the following tasks.

1. On a good sheet of graph paper, without the use of a calculator, sketch the graph of each side of the equation. Label and scale your axes, then label each graph with its equation.

2. Draw a number line below your graph. Drop a dashed, vertical line from the point of intersection to your number line, then shade and label the solution of the equation on your number line.
3. Solve the equation algebraically. Make sure that this solution matches that found in part (2) before proceeding to the next exercise.

(a) $2x + 3 = 7$
(b) $5 - 3x = -4$
(c) $2x + 3 = 15 - 2x$
(d) $3x - 5 = 10 - 2x$

EXERCISE 6. Follow the instructions in Exercise 5 to solve the following inequalities, both graphically and analytically. In each case, describe your solution set in both set-builder and interval notation.

(a) $2x + 3 < 7$
(b) $3 - 4x \geq -5$
(c) $3x - 5 \leq 3 - x$
(d) $2x + 4 > 5 - x$

EXERCISE 7. For each of the following equations, perform each of the following tasks.

1. Enter the left hand side of the equation (inequality) into Y1, then the right hand side into Y2 in the Y= menu. Adjust the viewing window so that the point(s) of intersection are visible in the view screen. When satisfied, make a copy on your examination paper. Label and scale each axis with xmin, xmax, ymin, and ymax, then label each graph with its equation.
2. Use the `intersect` utility in the `CALC` menu to find the coordinates of the point(s) of intersection. Draw a number line below your graph, then shade and label the solution of the given equation (inequality) on your number line. If an inequality is involved, use set-builder and interval notation to describe the solution set.

(a) $|x + 2| = 2 - \frac{1}{2}x$
(b) $|x - 3| = 3 + \frac{1}{2}x$
(c) $|x - 4| < |\frac{1}{2}x + 3|$
(d) $|x - 1| \geq 2x + 3$

EXERCISE 8. A ball is thrown vertically upward with an initial velocity of 120 m/s. The height (in meters) h of the ball above ground level at time t (in seconds) is given by the equation

$$h = -4.9t^2 + 120t.$$

(a) Plot the graph of the equation with your graphing calculator. Adjust the window parameters until you have a window that shows the "turning point" of the graph and the t-intercept (where the graph crosses the time axis). Copy this result onto your examination paper, labeling axes, and scaling axes with the values of xmin, xmax, ymin, and ymax.
(b) Use the `value` utility in the `CALC` menu to determine the height of the ball at $t = 5$ and $t = 20$ seconds.
(c) Use the `maximum` utility in the `CALC` menu to determine the maximum height of the ball and the time at which this occurs. Place these estimates on your plot.

EXERCISE 9. Suppose that there is a one-time installation fee of \$50 to set up cable television service. After that, each month requires an additional \$25 fee for service.

(a) On a sheet of graph paper, create a plot of the total cost C for service as a function of x, the number of months of service. Label each axis appropriately and scale each axis so that you can fit the first year's service on your plot.
(b) Show how you can use your plot to find the total cost for six months of service. Indicate this result on your plot in the manner shown in the figure from Example 4 at the top of page 168 in your text.

(c) Show how you can use your plot to determine the number of months of service that can be purchased for $200. Again, indicate this result on your plot in the manner shown in the figure from Example 4 at the top of page 168 in your text.

(d) Express the cost of service C as a function of the number of months of service x in an equation.

EXERCISE 10. Find the slope of the line passing through the given pair of points. *Note: This requires three separate computations, one line for each pair of points.*

(a) $(-2, 3)$ and $(5, -2)$ (b) $(-2, 5)$ and $(3, 5)$ (c) $(-3, 4)$ and $(-3, 6)$

EXERCISE 11. For each of the following relations (sets of ordered pairs), create a mapping diagram similar to that shown in Example 1 on page 180 of your text. State the domain and range of each relation, then tell whether or not the given relation is a function.

(a) $\{(1, 2), (1, 3), (2, 3), (3, -4)\}$ (b) $\{(1, -2), (2, -2), (3, 4), (4, 5)\}$

EXERCISE 12. Given $f(x) = x^2 - 3x - 5$, evaluate each of the following without the aid of a calculator. Show all steps of your work.

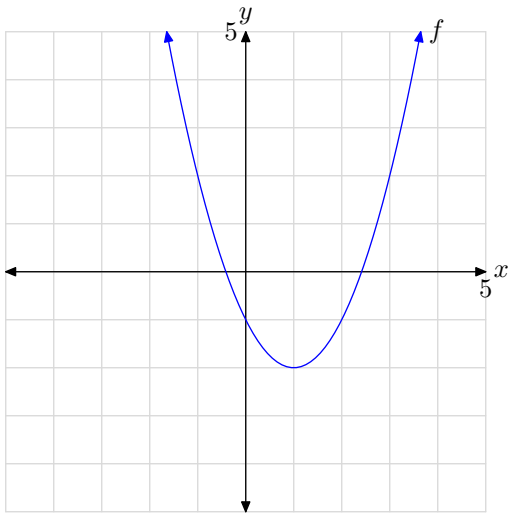
(a) $f(-3)$ (b) $f(2)$ (c) $f(0)$

EXERCISE 13. Given $f(x) = 2x + 3$ and $g(x) = 5 - 2x$, evaluate each of the following without the aid of a calculator.

(a) $f(-3)$ (b) $g(-2)$ (c) $f(g(1))$

(d) $f(a)$ (e) $g(a + 1)$ (f) $f(g(c + 2))$

EXERCISE 14. Use the following graph of f



to answer each of the following questions.

(a) Use interval notation to describe the domain of f.

(b) Use interval notation to describe the range of f.

(c) Use the graph of f to determine the value of $f(-1)$.

(d) Use the graph of f to determine the value(s) of x such that $f(x) = 3$.

EXERCISE 15. Use an algebraic technique to find the domain (set of "permissable" x-values) of the functions defined by each of the following equations.

(a) $f(x) = x^3 - 3x + 7$

(b) $f(x) = \sqrt{3 - 2x}$

(c) $f(x) = \dfrac{x+1}{x-3}$

(d) $f(x) = \dfrac{x}{\sqrt{x-1}}$