

## Math 141 Key Topics: 1.5, 2.1-2.3

### Section 1.5

- Finding the **least-squares** or **regression line** using the LinReg command on your calculator.
- Correlation coefficient,  $r$  – measures how well the least-squares line models the data. The closer  $|r|$  is to 1, the better the model.

### Section 2.1

- When solving a system of linear equations, there are 3 (and ONLY 3) possibilities:
  - Exactly One (Unique) Solution
  - Infinitely Many Solutions
  - No Solution
- When looking at a system of 2 equations with 2 variables (each equation is a line), the above 3 possibilities mean:
  - The lines intersect at exactly one point.
  - The lines are the same line. (Same slope AND  $y$ -intercept.)
  - The lines do not intersect...they are parallel. (Same slope, different  $y$ -intercepts.)
- If a system has infinitely many solutions, the solution must be parameterized.
- Know how to set up a system of equations. ALWAYS DEFINE YOUR VARIABLES.

### Sections 2.2-2.3

- Writing augmented matrices from a system of equations.
- If a matrix has  $m$  rows and  $n$  columns, then the size of the matrix is  $m \times n$ .
- Know when a matrix is in **Row-Reduced Form**. There are 4 criteria: (Note: Only consider the coefficient (left) side of the matrix when determining if a matrix is in row-reduced form.)
  - Each row that has all zeros lies below any other row with nonzero entries.
  - The first nonzero entry in each row is 1 (called a **leading 1**).
  - In any two successive nonzero rows, the leading 1 in the lower row lies further to the right than the leading 1 in the upper row.
  - If a column contains a leading 1, ALL other entries in that column are 0.
- The **Gauss-Jordan Elimination Method** is used to get a matrix in row-reduced form. There are 3 allowable row operations:

- Interchange any two rows.

Notation:  $R_i \leftrightarrow R_j$

- Replace any row by a nonzero constant multiple of itself.

Notation:  $cR_i$

- Replace any row by the sum of that row and a constant multiple of another row.

Notation:  $R_i + aR_j$  means to replace row  $i$  with the sum of row  $i$  and  $a$  times row  $j$ .

Note: Your instructor may use the GJ program in which case the above row operations can be done on the calculator.

- To **pivot** a matrix about an entry means to make that entry 1 and make all the other entries of that column 0.
- Using *rref* on the calculator to get a matrix in row-reduced form.
- Finding solutions from a row-reduced matrix.
  - If there is a row containing all zeros to the left of the vertical line and a nonzero entry to the right of the line, then the system has no solution.
  - If the above is not true and if every column to the left of the vertical line does not contain a leading one, then there are infinitely many solutions. Make the columns without leading 1's your parameters in order to parameterize the solution.