

MA 141 Reading Assignment 1–Appendix B

- (1) Explain what the rectangular coordinate system (or Cartesian coordinate system) is.
 - It is a system consisting of two axes called the x -axis and the y -axis on which points are denoted (a, b) , where the a corresponds to how far along the x -axis and the b corresponds to how far along the y -axis. See picture in class.

- (2) Describe and sketch the regions given by the sets $\{(x, y) | y > 4\}$ and $\{(x, y) | |x| \geq 2\}$.

- (3) State the distance formula for two points $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$.
 - $|P_1P_2| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- (4) Calculate the distance between the points $(10, 4)$ and $(-11, 5)$.

- (5) What is meant by an "equation of a curve"?

- (6) State the equation of a circle with center (h, k) and radius r .
 - $(x - h)^2 + (y - k)^2 = r^2$, where (x, y) is a point on the circle satisfying this equation.
- (7) What is the center and radius of the circle defined by the equation $(x - 10)^2 + (y + 15)^2 = 16$?

- (8) Show that $x^2 + y^2 - 4x + 10y + 13 = 0$ represents a circle and find its center and radius.

- (9) Define the slope of a line.
- (10) What is the slope of a nonvertical line passing through the points $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$?
- $m = \frac{\delta x}{\delta y} = \frac{y_2 - y_1}{x_2 - x_1}$
- (11) State the point-slope form of the equation of a line.
- An equation of the line passing through the point $P_1 = (x_1, y_1)$ and having slope m is $y - y_1 = m(x - x_1)$.
- (12) State the slope-intercept form of the equation of a line.
- An equation of the line with slope m and y -intercept b is $y = mx + b$.
- (13) Find an equation of the line passing through the points $(5, -3)$ and $(-1, 7)$.
- (14) When are two lines parallel?
- (15) When are two lines perpendicular?
- (16) Find an equation of the line passing through the point $(3, 4)$ and is parallel to the x -axis.
- (17) Find an equation of the line passing through the point $(1, 2)$ and is perpendicular to $4x - 8y = 1$.
- (18) Graph the inequality $2x + 5y \leq 10$.

(19) What is a conic section?

(20) What is a parabola?

(21) Sketch the parabolas $x = 3 - y^2$ and $y = 2 + x^2$.

(22) What is an ellipse? And what is the general equation for an ellipse?

- The general equation for an ellipse with foci $(-c, 0)$ and $(c, 0)$ and with the sum of the distances from a point on the ellipse to the foci be $2a$ is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, where $c^2 = a^2 - b^2$. Note that the x -intercepts of the ellipse are $\pm a$ and the y -intercepts are $\pm b$.

(23) Sketch the graph of $\frac{x^2}{8} + \frac{y^2}{18} = 2$.

(24) What is a hyperbola? And what is the general equation for a hyperbola?

- The general equation for a hyperbola with foci $(\pm c, 0)$ and with the difference of the distances from a point on the ellipse to the foci be $\pm 2a$ is $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, where $c^2 = a^2 + b^2$. Note that the x -intercepts of the ellipse are $\pm a$. The asymptotes of the hyperbola are $y = \pm(b/a)x$.

(25) Sketch the graph of $\frac{x^2}{8} - \frac{y^2}{18} = 2$.

- (7) What are two applications of exponential functions?
- (8) Under ideal conditions, a certain bacteria is known to double every 5 hours. Suppose that there are initially 100 bacteria.
- (a) What is the size of the population after 15 hours?

 - (b) What is the size of the population after t hours?

 - (c) Estimate the time for the population to reach 100,000.
- (9) A certain isotope has a half-life of 10 hours. A sample of this isotope has a mass of 4 grams.
- (a) How much isotope is left after 40 hours?

 - (b) How much isotope is left after t hours?

 - (c) Estimate the time for the mass of the isotope to reach 0.01 grams.

(10) What is e ? And why do mathematicians like to use the natural exponential function $y = e^x$?

(11) Starting with the graph of $y = e^x$, write the equation of the graph that results from:

(a) shifting 4 units upward

(b) shifting 3 units to the left

(c) reflecting about the x -axis

(d) reflecting about the y -axis

(e) reflecting about the x -axis and then about the y -axis