

MATH 12 — PROBLEMS FOR DISTANCE  
(Relating to Volumes of Rotations)

NAME \_\_\_\_\_

1. You are given the curve  $y = x^2$ .
  - (a) You are given the point  $P = (2, 4)$  on the curve. Find the distance between  $P$  and:
    - i. the  $x$ -axis. \_\_\_\_\_
    - ii. the  $y$ -axis. \_\_\_\_\_
    - iii. the line  $y = 9$ . \_\_\_\_\_
    - iv. the line  $x = 5$ . \_\_\_\_\_
  - (b) You are given the point  $P = (x, y)$  on the curve (assume that  $0 \leq x \leq 5, 0 \leq y \leq 9$ ). Find the distance (in general terms of  $x$  and then in terms of  $y$ ) between  $P$  and:
    - i. the  $x$ -axis. \_\_\_\_\_ (in terms of  $y$ ) \_\_\_\_\_
    - ii. the  $y$ -axis. \_\_\_\_\_ (in terms of  $y$ ) \_\_\_\_\_
    - iii. the line  $y = 9$ . \_\_\_\_\_ (in terms of  $y$ ) \_\_\_\_\_
    - iv. the line  $x = 5$ . \_\_\_\_\_ (in terms of  $y$ ) \_\_\_\_\_
2. You are given the line  $y = 3x + 2$ .
  - (a) You are given the point  $P = (1, 5)$  on the line. Find the distance between  $P$  and:
    - i. the  $x$ -axis. \_\_\_\_\_
    - ii. the  $y$ -axis. \_\_\_\_\_
    - iii. the line  $y = 4$ . \_\_\_\_\_
    - iv. the line  $x = 5$ . \_\_\_\_\_
  - (b) You are given the point  $P = (x, y)$  on the line (assume that  $1 \leq x \leq 5, 2 \leq y \leq 17$ ). Find the distance (in general terms of  $x$ ) between  $P$  and:
    - i. the  $x$ -axis. \_\_\_\_\_
    - ii. the  $y$ -axis. \_\_\_\_\_
    - iii. the line  $y = 4$ . \_\_\_\_\_
    - iv. the line  $x = 5$ . \_\_\_\_\_
3. Given a disk with center on the line  $y = 1$  and edge on the curve  $y = x^3 + x$ , what is the radius of the disk
  - (a) at  $x = 1$ ? \_\_\_\_\_
  - (b) at  $x = 2$ ? \_\_\_\_\_
  - (c) at an arbitrary  $x$  (with value greater than 1). \_\_\_\_\_
4. Imagine a cylinder with central axis on the  $y$ -axis. The lower rim sits on the line  $y = x$  and the upper rim sits on the curve  $y = x^2 + 1$ .
  - (a) What is the height when the radius is 1? \_\_\_\_\_
  - (b) What is the height when the radius is 2? \_\_\_\_\_
  - (c) What is the height when the radius is  $x$  (for  $x \geq 0$ )? \_\_\_\_\_