

**WORKSHEET 1**

1. Below is a list of some “simple” algebra problems. Some of the solutions are correct and some of them are **wrong!** For each problem:
  - A. determine if the answer is correct;
  - B. determine if there are any mistakes made in solving the problem and list them (**note** that just because the answer is correct does not mean there are no mistakes);
  - C. if there are mistakes, redo the problem correctly; if there are no mistakes, devise **ANOTHER** correct method to solve the problem.

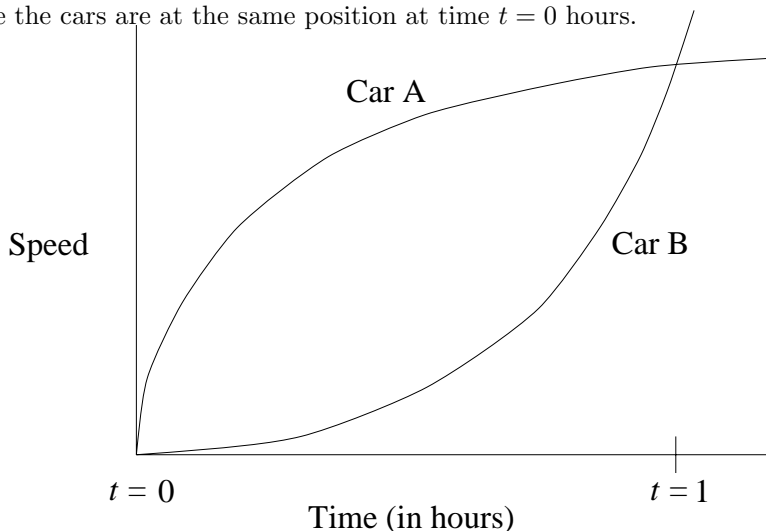
a)  $\frac{x^2 - 1}{x + 1} = \frac{x^2 + (-1)}{x + 1} = \frac{x^2}{x} + \frac{-1}{1} = x - 1$       b)  $(x + y)^2 - (x - y)^2 = x^2 + y^2 - x^2 - y^2 = 0$

c)  $\frac{9(x - 4)^2}{3x - 12} = \frac{3^2(x - 4)2}{3x - 12} = \frac{(3x - 12)^2}{3x - 12} = 3x - 12$       d)  $\frac{x^2 y^5}{2x^{-3}} = x^2 y^5 \cdot 2x^3 = 2x^6 y^5$

e)  $\frac{(2x^3 + 7x^2 + 6) - (2x^3 - 3x^2 - 17x + 3)}{(x + 8) + (x - 8)} = \frac{(2x)^2 - 17x + 9}{2x} = 2x - 17x + 9 = -15x + 9 = -6x$

f)  $\frac{x^{-1} + y^{-1}}{x^{-1} - y^{-1}} = \frac{(x + y)^{-1}}{(x - y)^{-1}} = \left(\frac{x + y}{x - y}\right)^{-1} = -\frac{x + y}{x - y} = \frac{x + y}{y - x}$

2. Find the equations of *all* lines through the point  $(a, a^2)$  which intersect the curve  $y = x^2$  exactly once.
3. The following graph represents speed vs. time for two cars, A and B, traveling the same direction along a road. Assume the cars are at the same position at time  $t = 0$  hours.



- a) State the relationship between the position of car A and car B at  $t = 1$  hour.
- b) State the relationship between the speed of car A and car B at  $t = 1$  hour.
- c) State the relationship between the acceleration of car A and car B at  $t = 1$  hour. Explain.
- d) What is happening to the relative position of the two cars during the time interval between  $t = 0.75$  hours and  $t = 1$  hour? (e.g. is one car pulling away from the other?) Explain.

4. a) Use absolute values to define a formula that gives the distance between two numbers  $x_1$  and  $x_2$  on the real number line.
- b) What is the distance formula for two points  $(x_1, y_1)$  and  $(x_2, y_2)$  in two dimensions?
- c) What is the distance formula for two points  $(x_1, y_1, z_1)$  and  $(x_2, y_2, z_2)$  in three dimensions?
- d) Rewrite the distance formula for one dimension using the same pattern as your answers for parts b) and c). Is this the same formula you wrote down in part a)? Why or why not?

5. a) Write an inequality which expresses the following: "The distance from  $x$  to 3 is no more than 5."
- b) Rewrite the inequality

$$0 < |x - 2| < 1$$

as a sentence giving information about the distance between two points on the number line.

- c) Using your rewritten version of the inequality  $0 < |x - 2| < 1$ , shade on a number line the possible values for  $x$ .
- d) Solve the inequality  $0 < |x - 2| < 1$  **algebraically** for  $x$ .
- e) Graph on the same axes the function  $f(x) = |x - 2|$  and the lines  $y = 0$  and  $y = 1$ . Use this diagram to **graphically** solve the inequality  $0 < |x - 2| < 1$ .

6. Solve for  $x$

a)  $(x - 4)(x + 1) < 0$

b)  $x > \frac{1}{x}$

c)  $x^3 < 1$

d)  $x^2 < 0$

7. A working light bulb is in a closed room with no windows. Outside the room, is a panel of three switches, one of which controls the light inside (up is on, down is off.) You may do anything you like to the three switches and then enter the room to inspect the light. After this, without any further experimentation, you must indicate which switch controls the light. What do you do?