

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 the answer to (A) or (B) is **NO**, redo the problem correctly;  
 if the answers to (A) and (B) are **YES**, devise a 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)  $\frac{x^2 y^5}{2x^{-3}} = x^2 y^5 * 2x^3 = 2x^6 y^5$

(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 domain of each of the following functions.

(a)  $f(x) = 2x + 10$

(b)  $f(x) = \frac{x + 4}{2x + 10}$

(c)  $f(x) = \sqrt{2x + 10}$

(d)  $f(x) = \frac{x + 4}{\sqrt{2x + 10}}$

(e)  $f(x) = \sqrt{x(x + 3)(2x + 5)}$

(f)  $g(x) = \sqrt{\frac{x - 2}{3x + 1}}$

3. For each of the following, find functions  $f$  and  $g$  such that  $h = f \circ g$ .

(a)  $h(x) = \frac{1}{(x^2 + 5x - 2)^4}$

(b)  $h(x) = \sqrt{x^2 + 9}$

4. If  $f(x) = x^2 + 3$ , find each of the following:

(a)  $f(2)$

(b)  $f(a)$

(c)  $f(x + h)$

(d)  $f(x + h) - f(x)$

(e)  $\frac{f(x + h) - f(x)}{h}$