

Worksheet 1 (Inequalities)

1. Determine the range of values of  $x$  for which the following inequalities hold:

a.  $3x - 4 \leq 2(x - 4) + 5x$

b.  $\frac{2}{2x + 1} \geq \frac{3}{4}$

c.  $\frac{3x^2 + x - 2}{(3x - 1)(x + 2)} \leq 0$

d.  $3 + \frac{7}{x - 2} \geq \frac{1}{x - 1}$

e.  $\frac{4}{x - 2} < -3 - \frac{2}{x + 1}$

f.  $\frac{(x - 1)^3 (x + 2) (x - 3)}{(x^3 - 1) (x^2 - 4x + 4)} \leq 0$

2. In each case determine the range of values of  $x$  for which the following inequalities hold:

a.  $|2x - 3| > 4$

b.  $|2x - 3| \leq |3x + 4|$

c.  $|2x - 3| < 0$

d.  $|3x + 1| > 0$

e.  $\left| \frac{x - 3}{2x - 1} \right| \leq 1$

f.  $|2x + 1| \leq 3x$

g.  $|2x + 1| \leq -3x$

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3. Find the domain of the relations given below:

a.  $f = \{(x, y): x^2 + y^2 = 16, x, y \in \mathbb{R}\}$

b.  $f = \{(x, y): x^2 - y^2 = 16, x, y \in \mathbb{R}\}$

c.  $f = \{(x, y): xy = 4, x, y \in \mathbb{R}\}$

d.  $f = \{(x, y): y^2 = 16x, x, y \in \mathbb{R}\}$

e.  $f = \{(x, y): y = 4x^2, x, y \in \mathbb{R}\}$

f.  $f = \left\{ (x, y): y = \frac{2x + 1}{3x - 2}, x, y \in \mathbb{R} \right\}$

4. Without the use of an electronic aid, sketch the following curves:

a.  $y = x^2$

b.  $y = x^3$

c.  $y = x^4$

d.  $y = (x - 2)^3$

e.  $y = x^2 + x^3$

f.  $y = \frac{1}{x}$

g.  $y = \frac{1}{x^2}$

h.  $y = \frac{1}{(x - 2)^2}$

i.  $y = \frac{x}{(x - 2)^2}$

j.  $y = |x|$

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k.  $y = |x + 2|$

l.  $y = |2x - 1| - |x|$

5. Without use of an electronic aid, sketch the graphs of the piece-wise functions defined below:

a. 
$$f(x) = \begin{cases} 3x & x < -2 \\ 2x + 1 & -2 \leq x < 1 \\ x^2 + 2 & x \geq 1 \end{cases}$$

b. 
$$f(x) = \begin{cases} \sqrt{x} & x > 4 \\ \frac{x}{2} & x \leq 4 \end{cases}$$