

Math 2143 - Brief Calculus with Applications

Homework #2 - 2008.01.22

Due Date - 2008.01.29

Solutions

1. Write the function $f(x) = \left| \frac{7}{5}x - 9 \right|$ as a piecewise function and without absolute values.

First, we solve $\frac{7}{5}x - 9 = 0$, which gives $x = \frac{45}{7}$. Since this is the graph of a line with positive slope, we get that

$$\left| \frac{7}{5}x - 9 \right| = \begin{cases} \frac{7}{5}x - 9, & x \geq \frac{45}{7} \\ 9 - \frac{7}{5}x, & x < \frac{45}{7} \end{cases}$$

2. Write the function $g(x) = |x^2 + 8x - 9|$ as a piecewise function and without absolute values.

The function is a parabola opening upward, with roots at $x = 1$ and $x = -9$. So we have

$$|x^2 + 8x - 9| = \begin{cases} x^2 + 8x - 9, & x > 1 \\ -x^2 - 8x + 9, & -9 \leq x \leq 1 \\ x^2 + 8x - 9, & x < -9 \end{cases}$$

3. State the domain of the following functions.

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

We require that $9x + 2 \geq 0$, this gives $x \geq -\frac{2}{9}$. So the domain is $[-\frac{2}{9}, \infty)$.

b) $i(x) = \sqrt[3]{9x + 2}$

The domain is simply \mathbb{R} .

4. Consider the function given by

$$j(x) = \begin{cases} -x + 4, & x < -12, \\ 2x + 3, & -12 \leq x < -2, \\ 4x^2 - 2x + 3, & -2 \leq x \leq 1, \\ |x + 2|, & 1 < x. \end{cases}$$

a) Find $j(-15)$

$$j(-15) = -(-15) + 4 = 19$$

b) Find $j(12)$

$$j(12) = |12 + 2| = 14$$

c) Find $j(-2)$

$$j(-2) = 4(-2)^2 - 2(-2) + 3 = 23$$

d) Find $j(1)$

$$j(1) = 4(1)^2 - 2(1) + 3 = 5$$

e) Find $j(-12)$

$$j(-12) = 2(-12) + 3 = -21$$