Finding the domain and range of a function

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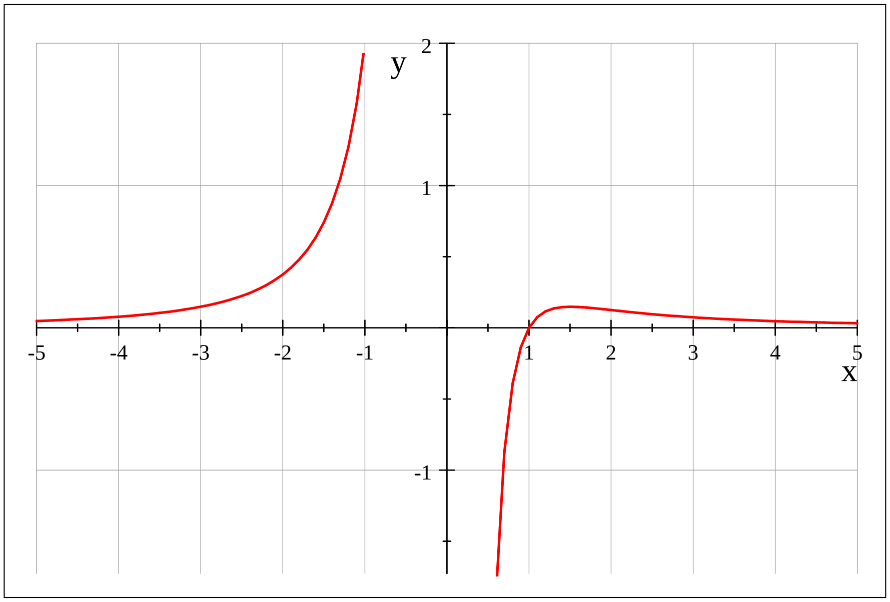
Math 141

1. Find the domain and the range the function $g(x) = \frac{x-1}{x^3}$



$$D_g = \left\{ x \in \mathbb{R} : x^3 \neq 0 \right\}.$$

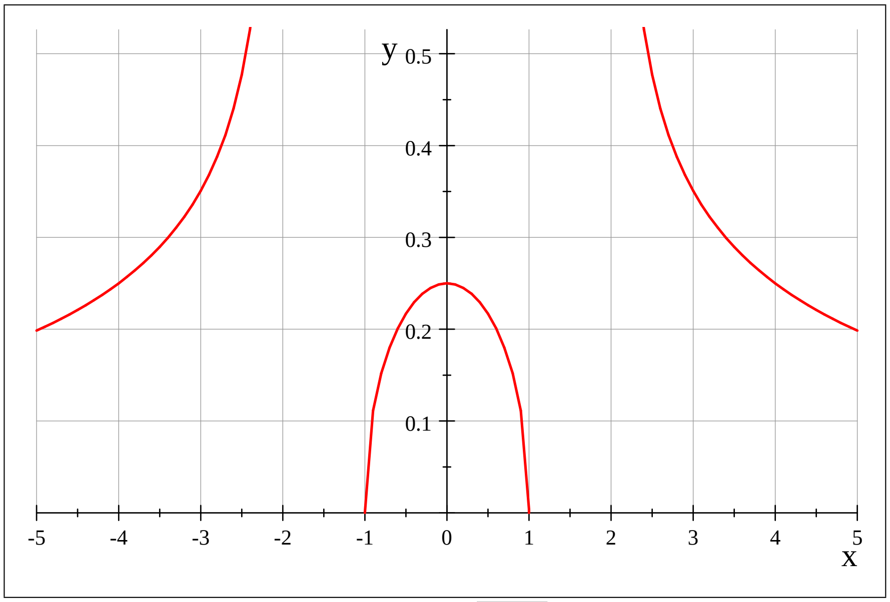
Thus clearly D_g is all real numbers except zero $D_g = (-\infty, 0) \cup (0, \infty)$. As for the range of g,vertically the graph of g goes from negative infinity to positive infinity. Thus the range of g is

$$R_g = (-\infty, \infty).$$

2. Find the domain and range of the function $f(x) = \sqrt{\frac{x^2-1}{x^4-16}}$

$$D_f = \left\{ x \in \mathbb{R} : \frac{x^2-1}{x^4-16} \geq 0 \text{ and } x^4 - 16 \neq 0 \right\}$$

We first solve the inequality $\frac{x^2-1}{x^4-16} \geq 0$ which solution is obtained by looking at the portion of the graph of $\frac{x^2-1}{x^4-16}$ above the x-axis. Solution is: $(-\infty, -2) \cup [-1, 1] \cup (2, \infty)$. Now we solve the equation $x^4 - 16 = 0$, Solution is: 2. Thus, the domain $D_f = (-\infty, -2) \cup [-1, 1] \cup (2, \infty)$. To compute the range of the function f we look at "the shadow of the graph of f on the y-axis. In other words, the graph of the function goes from zero all the way to infinity. One can see that the range is $R_f = [0, \infty)$.



$$f(x) = \sqrt{\frac{x^2-1}{x^4-16}}$$