MATH-241 Calculus I — P.-O. Parisé

Homework 01 Solutions — Spring 2022

Section 1.1, Problem 4

(a) $f(-4) = -2$ and $g(3) = 4$.

(b) For $x = -2$ and $x = 2$.

(c) The solutions are $x = -3$ and $x = 4$.

(d) On $(0, 4)$.

(e) $\mathrm{Dom}(f) = [-4, 4]$ and $\mathrm{Ran}(f) = [-2, 3]$.

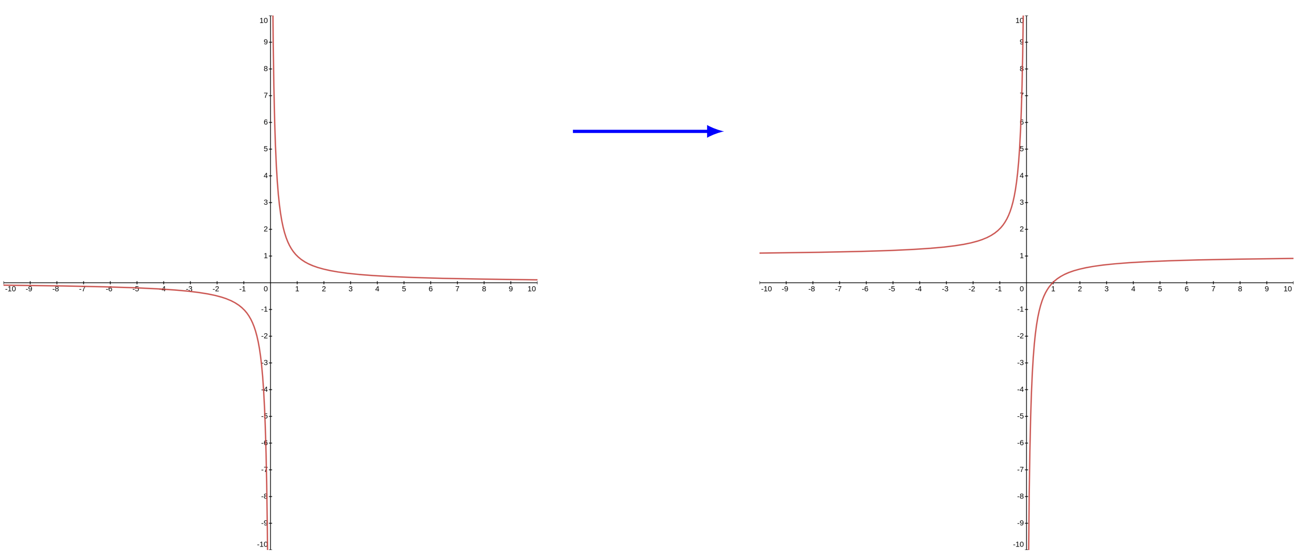
(f) $\mathrm{Dom}(g) = [-4, 3]$ and $\mathrm{Ran}(g) = [0.5, 4]$.

Section 1.2, Problem 6

The denominator must never vanish. So we find where $1 - \tan x = 0$. This occurs when $1 = \tan x$, which is equivalent to $x = \pi/4 + k\pi$ where k is any integer. Also, the domain of the tan function is $(-\infty, \infty)\backslash\{\pi/2 + k\pi \,:\, k \in \mathbb{Z}\}$. So $\mathrm{Dom}(f) = (-\infty, \infty)\backslash\{\pi/4 + k\pi, \pi/2 + k\pi \,:\, k \in \mathbb{Z}\}$.

Section 1.3, Problem 12

We see that the function $y = 1 - 1/x$ is a reflection of the graph of $1/x$ about the x-axis and a upward translation of 1 of the resulting graph. It should look like this:



$\boxed{\textbf{Section 1.3, Problem 48}}$

Let $f(x) = x/(1+x)$ and $g(t) = \tan t$. Then we see that $u(t) = f \circ g(t)$.

$\boxed{\textbf{Section 1.4, Problem 8}}$

(a) (i) $v_{ave} = \frac{s(2)-s(1)}{2-1} = 3-(-3) = 6\,\text{cm/s}$.

(ii) $v_{ave} = \frac{s(1.1)-s(1)}{1.1-1} \approx -4.7120\,\text{cm/s}$.

(iii) $v_{ave} = \frac{s(1.01)-s(1)}{1.01-1} \approx -6.1341\,\text{cm/s}$.

(iv) $v_{ave} = \frac{s(1.001)-s(1)}{1.001-1} \approx -6.2683\,\text{cm/s}$.

(b) We first give an estimation using a point on the left side of 1, say 0.999. We get $v_{ave} \approx -6.2746$cm/s. So we estimate the instantaneous velocity as

$$v \approx \frac{-6.2683 + (-6.2746)}{2} = -6.2714\,\text{cm/s}.$$