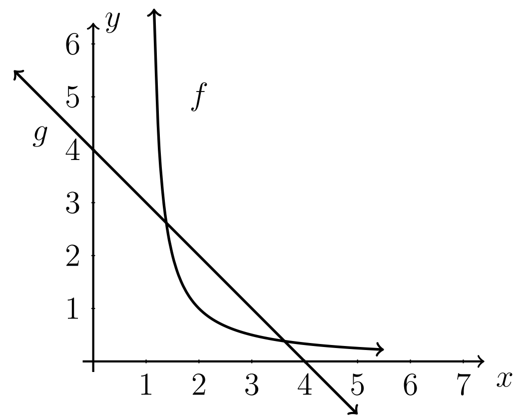
BECA / IB Math 4-Polynomial and rational functions Name:
7 February 2022

**4.8 Classwork: Direct and inverse variation**

1. The inverse function $f(x) = \dfrac{1}{x-1}$, defined for $x > 1$, and the linear function $g(x) = -x + 4$ are graphed below.

   (a) Find the solutions to $f(x) = g(x)$.

   (b) Write down the equation of the vertical asymptote to $f$.

2. The total tuition charged by a college undergraduate program is proportional to the number of full-time semesters attended. (values are for Lehman College, ignoring aid.)

   (a) Write down an equation to model the cost, using the variable $C$ as the total tuition cost and $s$ for the number of semesters.

   (b) Explain what the proportionality constant, $k$, means in this context.

   (c) If a student pays total tuition of \$27,720 over four years of full-time study, find the cost of a single semester.

   (d) A student takes an extra three semesters. Find the additional tuition cost.

3. Two friends share an apartment convenient to Lehman, each paying \$1,500 per month.

   (a) Model the apartment cost as an inverse variation, with $r$ as each individual's monthly rent share and $f$ for the number of friends in the apartment.

   (b) Explain what the proportionality constant, $k$, means in this context.

   (c) If they add a third roommate, how much would that lower the monthly rent for the first two friends?

4. A rational function of the form $f(x) = \dfrac{1}{x-p} + q$ is shown on the grid below.

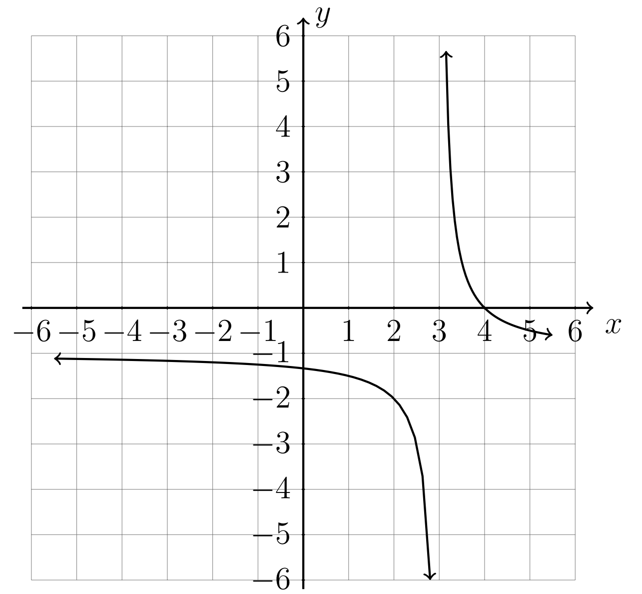
   (a) Write down the equation of the horizontal asymptote.

   (b) Write down the equation of the vertical asymptote.

   (c) Hence, write down $p$ and $q$.

   (d) Find $f(0)$.

   (e) Solve for $x$ such that $f(x) = 0$.




5. The temperature ($C^\circ$) over a 24 hour day starting at midnight is modeled by the function $f\,(t) = -0.0075t^3 + 0.17t^2 + 0.02t + 5$.

   (a) Write down the temperature at midnight, when $t = 0$.

   (b) Over what interval is the temperature increasing?

   (c) Find the maximum temperature during the day.