1. Let \( f(x) = \frac{2x^2 - 8x}{x^2 - 4x - 21} \).

(a) Determine the domain of \( f(x) \). (3 points)

(b) Determine the vertical asymptote(s) on the graph of \( y = f(x) \). (3 points)

(c) Determine the horizontal asymptote on the graph of \( y = f(x) \). (3 points)

(d) Determine the \( y \)-intercept on the graph of \( y = f(x) \). (3 points)

(e) Determine the \( x \)-intercept(s) on the graph of \( y = f(x) \). (3 points)

(f) Sketch the graph of \( y = f(x) \) showing all asymptotes and \( x \)-intercepts. (5 points)
2. Sketch the graph of \( g(x) = \frac{(2x + 1)(x - 2)^2(x - 5)}{(x - 8)^2(x + 5)(x - 1)} \). Show all asymptotes and x-intercepts. 

(8 points)
3. Let \( h(x) = 2 + \frac{1}{x} \).

(a) Determine \( h^{-1}(0) \). (3 points)

(b) Determine \( h^{-1}(x) \). (3 points)

(c) Determine \( (h \circ h^{-1})(6) \). (3 points)

(d) Determine the range of \( h(x) \). (3 points)

(e) Determine the range of \( h^{-1}(x) \). (3 points)
4. The graph of a one-to-one function \( P(x) \) is shown below.

(a) Determine \( P(-2) \). (3 points)

(b) Determine \( P^{-1}(-2) \). (3 points)

(c) Determine the domain of \( P^{-1}(x) \). (3 points)

(d) Determine the range of \( P^{-1}(x) \). (3 points)

(e) On the graph with \( P \) draw the graph of \( y = P^{-1}(x) \). (3 points)
5. Match the following rational functions with their descriptions given below. Each question has one correct answer. However, the functions may be used more than once. (3 points each)

A(x) = \( \frac{x^2 + x}{9-x^2} \)  

B(x) = \( \frac{(x+1)(x-3)^2}{x+9} \)  

C(x) = \( \frac{1-x^3}{x^2-9} \)  

D(x) = \( \frac{x+2}{(x+1)(x-3)^2} \)  

E(x) = \( \frac{2x^3-4}{2x^2-8} \)  

F(x) = \( \frac{x^2-1}{x^2+5x} \)

_____ (a) Has the line \( x = 2 \) as an asymptote

_____ (b) Has no y-intercept

_____ (c) Has the x-axis as an asymptote

_____ (d) Has the line \( y = 1 \) as an asymptote

_____ (e) Looks like on the far left and far right

_____ (f) Passes through the origin

_____ (g) Has exactly one vertical asymptote

_____ (h) Has a y-intercept \((0, b)\) with \(b\) negative

_____ (i) Has a vertical asymptote where the behavior on both sides of the asymptote is the same

_____ (j) Has an oblique asymptote with negative slope

_____ (k) Passes through the point \((-2, 0)\)
6. Let \( H(x) = \frac{(x^2 - 4)(2x^2 - 5x - 3)}{(x^2 - 3x + 2)(x^2 - 25)} \). Determine the following. (3 points each)

(a) Domain of \( H \)  
(b) y-intercept on graph of \( H \)

(c) x-intercept(s) on graph of \( H \)  
(d) Horizontal asymptote on graph of \( H \)

(e) The coordinates of the “hole” in the graph of \( H \)
7. Let \( f(x) = 16 - 2^x \). Determine each of the following. If the function does not have a particular feature, write NONE. (3 points each)

(a) Domain of \( f \)

(b) Range of \( f \)

(c) \( x \)-intercept(s) on graph of \( f \)

(d) \( y \)-intercept on graph of \( f \)

(e) horizontal asymptote on graph of \( f \)

(f) vertical asymptote(s) on graph of \( f \)

(g) Is the function \( f \) increasing or decreasing?

(h) Describe using shifts and/or reflections how the graph of \( y = f(x) \) is related to the graph of \( y = 2^x \).