Math 105, Precalculus
Quiz 7, Sections 3.6 and 4.1
November 19, 2009

Use of calculators is not permitted on this quiz. Please show all work neatly.

1. Let \( f(x) = \frac{12}{x^2 - 4} \)
   
   a) Find the following, if they exist. If they do not exist, write “not applicable” and show work to explain why.
   
   i) x-intercept(s) \( \text{None/N/A} \) (because 12 \( \neq 0 \) anywhere, no variable in numerator) \( 1 - \frac{12}{-2} \) if no justification.
   
   ii) y-intercept \( y = -3 \) \( f(0) = \frac{12}{-2} y = -3 \) if no justification. \( 0 \)
   
   iii) Vertical asymptote(s) \( x = 2, x = -2 \) \( x^2 - 4 = 0 \); \( x + 2 \), \( x - 2 \), \( y = 2 \)
   
   iv) Horizontal asymptote \( 0 \) (degree of denominator is > degree of numerator)

   b) Graph the function \( f(x) \), checking your work by finding at least one function value in each interval you create.

2. Let \( g(x) = 3^x + 4 \).
   
   a) Compared to the graph of \( f(x) = 3^x \), \( g(x) \) is reflected across the \( y \) axis (if any) and shifted \( \text{up} \) (direction) by \( 4 \) units.

   b) Complete the following:
   
   i) As \( x \to +\infty \), \( g(x) \to +\infty \).
   
   ii) As \( x \to -\infty \), \( g(x) \to +\infty \).
   
   iii) The domain of \( g(x) \) is \( \mathbb{R} \).

   iv) \( g(0) = 5 \) \( 3^0 + 4 = 5 \)

   v) \( g(1) = \frac{11}{3} \) \( g(1) = 3^{-1} + 4 = \frac{1}{3} + 4 \)

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1. Let \( f(x) = \frac{9}{x^2 - 9} \)

   a) Find the following, if they exist. If they do not exist, write "not applicable" and show work to explain why.
      i) \( x\)-intercept(s) \( \frac{9}{x^2 - 9} \) Because \( x \neq \pm 3 \), No variables in numerator.
      ii) \( y\)-intercept \( y = -1 \) \( (0, -1) \) \( f(0) = \frac{9}{0 - 9} = -1 \)
      iii) Vertical asymptote(s) \( x = -3, x = 3 \) \( -x^2 + 9 = 0 \) \( (x+3)(x-3) = 0 \), \( x = -3, x = 3 \)
      iv) Horizontal asymptote \( y = 0 \) (degree of denominator > degree of numerator)

   b) Graph the function \( f(x) \), checking your work by finding at least one function value in each interval you create.

2. Let \( g(x) = 4^{-x} - 2 \).

   a) Compared to the graph of \( f(x) = 4^x \), \( g(x) \) is reflected across the \( y \)-axis (if any) and shifted \( \text{down} \) (direction) by \( 2 \) units.

   b) Complete the following:
      i) As \( x \to -\infty \), \( g(x) \to -\infty \)
      ii) As \( x \to +\infty \), \( g(x) \to -2 \) \( (\text{Horizontal Asymptote}) \)
      iii) The domain of \( g(x) \) is \( (-\infty, \infty) \)
      iv) \( g(1) = \frac{-1^3}{4} = -\frac{1}{4} \)
      v) \( g(0) = \frac{-1}{4} \), \( 4^{-0.5} = 1/2^{-1} = 2 \times 1/4 = 1/2 \)

   c) The graph of \( h(x) = 4^{-x} + 2 \) is obtained by \( \text{up} \) (direction) \( 2 \) units of \( g(x) \).