This guide gives some sample questions for the test on Pre-Calculus. See also the MATH 2301 Calculus I handbook and MATH 1300 Precalculus website.

1. Verify the identity \( \frac{1}{1 - \cos(\theta)} + \frac{1}{1 + \cos(\theta)} = 2 \csc^2(\theta) \).

2. Solve the following equation for \( x \): \( \log_3(x - 4) + \log_3(x + 4) = 2 \).

3. The function \( f(x) = -7 + \sqrt{4x - 5} \) is one-to-one on its domain.
   (a) Find a formula for its inverse, \( f^{-1}(x) \).
   (b) Verify your formula is correct by computing and simplifying \( f \circ f^{-1}(x) \).

4. Consider the rational function
   \[ f(x) = \frac{3x^2 - 3x}{x^2 - 5x + 4} \]
   (a) Express the domain of \( f \) in interval notation.
   (b) Find the \( x \) and \( y \) intercepts of \( f \).
   (c) Find all vertical and horizontal asymptotes.
   (d) Identify any holes.
   (e) Sketch a detailed graph of \( f \).

5. Simplify and cancel so that you can plug in the given value without dividing by 0.
   (a) For \( x = 2 \), \( \frac{x^2 + x - 6}{x - 2} = \)
   (b) For \( x = 4 \), \( \frac{\sqrt{x} - 2}{x - 4} = \)
   (c) For \( h = 0 \), \( \frac{(x + h)^2 - x^2}{h} = \)
   (d) For \( h = 0 \), \( \frac{(x + h)^{-1} - x^{-1}}{h} = \)