Math 1081, Quiz 1   Name: _____

1. Suppose $\log_b x = 2, \log_b y = 3, \log_b z = 5$. Find the following:

   (a) $\log_b \left(\dfrac{\sqrt{xyb}}{zb^2} \right)$

   (b) $\dfrac{x^3 y^2}{\sqrt{bz}}$ if $b = 2$.

2. Suppose a 5-year CD (cash deposit) has an interest rate of 2.27% compounded daily. With a deposit of P_0 dollars, the account grows like

$$P(t) = P_0(1 + .0227/365)^{365t}, t \text{ in years.}$$

   (You may leave your answers in terms of exp/log if you don't want to use a calculator.)

   (a) What is the value of the account (after 5 years) if $10,000 was deposited initially?

   (b) How long does it take for the value of the account to double?

3. Consider

$$g(x) = \frac{2x^2 - 8}{x^2 - 5x + 6}.$$

    (a) Where is g discontinuous?

    (b) Find $\lim\limits_{x \to 2} g(x)$.

    (c) Find $\lim\limits_{x \to 3-} g(x)$, $\lim\limits_{x \to -3+} g(x)$.

    (d) Find $\lim\limits_{x \to \infty} g(x)$.

4. Draw the graph of a function f with the following properties:

(a) f has domain $[-5, 5]$

(b) f is continuous except at $x = -2, 2$

(c) $\lim\limits_{x \to -2^-} f(x) = -1$, $\lim\limits_{x \to -2^+} f(x) = 1$, $f(-2) = 0$

(d) $\lim\limits_{x \to 2^-} f(x) = +\infty$, $\lim\limits_{x \to 2^+} f(x) = -\infty$, $f(2) = 1$

5. Consider the function $f(x) = \sqrt[3]{x}$ $(= x^{1/3})$.

   (a) What is the average rate of change of f over the interval $[1, 8]$?

   (b) Find the instantaneous rate of change of f at $x = 1$.

      (Hint: Multiply both the numerator and denominator of

      $$\frac{x^{1/3} - 1}{x - 1} \quad \text{or} \quad \frac{(1+h)^{1/3} - 1}{h}$$

      by

      $$x^{2/3} + x^{1/3} + 1 \quad \text{or} \quad (1+h)^{2/3} + (1+h)^{1/3} + 1,$$

      i.e. use the "difference of cubes" factorization

      $$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

      to get rid of the $x - 1$ or h in the denominator.)