Exam #3 · Thursday Nov. 10, 2005

MATH 110 · Section 10 · Fall 2005 Name _____

Problem 1. Let

$$f(x) = \frac{2(x-1)(x+2)}{(x+1)(x-2)}.$$

(a) (**5 points**) The x-intercept(s) of $f(x)$ are:
(A) 1 and -2 (B) -1 and 2 (C) 1, -1, 2, and -2
(D) $f(x)$ has no x-intercepts (E) None of these

(b) (**5 points**) The vertical asymptote(s) of $f(x)$ are:
(A) 1 and -2 (B) -1 and 2 (C) 1, -1, 2, and -2
(D) $f(x)$ has no vertical asymptotes (E) None of these

(c) (**5 points**) Find an equation for the extreme behavior (i.e. horizontal or slant asymptote) of $f(x)$.

Problem 2. Let

$$g(x) = \frac{3(x^2+2x+1)}{x^2-1}.$$

(a) (**5 points**) True or false: $g(x)$ has a vertical asymptote at $x = 1$.

(b) (**5 points**) True or false: $g(x)$ has a vertical asymptote at $x = -1$.

Problem 3. (**6 points**) The following is a graph of the equation $y = kb^x$. Find the values of k and b.

Problem 4. You invested \$800 in a savings account at your hometown bank in May of 2005. The interest rate is 3%, compounded monthly. Due in part to your outstanding success in math 110, you are on track to graduate in May of 2009.
(a) (**6 points**) What will be your balance when you graduate?

(b) (**6 points**) After how many years (to the nearest 0.1 year) will your balance be \$1000? (Hint: There is an algebraic way to solve this problem and a graphical way. Use either one.)

Problem 5. (**6 points**) After graduation, you plan to purchase a new Ford Fiesta to drive to your new job in Connecticut. Projected cost in November of 2009 is \$12,000. It is now November of 2005. Assuming a local bank has annual interest rate of 4% compounded continuously, how much should you invest now in order to reach your desired goal?

Problem 6. (**6 points**) A baked potato is heated to 50°C and placed on the counter. From that time, its temperature $A(t)$ in degrees Celsius, with time t measured in hours, is described by the equation

$$A(t) = 22 + (50 - 22)e^{-0.41t}.$$

What is the limiting temperature of the potato after an indefinitely large amount of time goes by?

(A) 50°C (B) 22°C (C) 28°C
(D) Cannot be determined from the above information (E) None of these

Problem 7. (**6 points**) Which of the following functions are one-to-one?

(A) 1 and 2 only (B) 1 and 3 only (C) 2 only
(D) 2 and 3 only (E) All of them

Problem 8. (**6 points**) Let

$$h(x) = \frac{2x + 3}{x - 4}.$$

Algebraically find the inverse function $h^{-1}(x)$.

Problem 9. Let $g(x) = \log(x + 3) - 2$.
(a) (**5 points**) Find the domain of $g(x)$.

(b) (**5 points**) Find the x-intercept(s) and y-intercept(s) of $g(x)$, if any, to the nearest 0.01.

(c) (**5 points**) Find the horizontal and vertical asymptote(s) of $g(x)$, if any.

Problem 10. (**6 points**) Expand the following expression as much as possible:

$$\log\left(\frac{ax^2 + bx + c}{d^3}\right).$$

Problem 11. (**6 points**) Solve the following equation for x:

$$\log(x+3) - 2 = 4.$$

Problem 12. (**6 points**) The radioactvity of a mysterious substance found in a beaker is given by the equation

$$R(t) = 2.8e^{-0.4t}$$

where t is measured in hours and $R(t)$ measured in units of rems. Find (to within the nearest 0.01) the time t at which $R(t)$ is one fourth of its original amount $R(0)$.