MATH 121 (9am, S.Smith) Sample Exam 2's Fall 04

These exams were given in 2001, using the previous textbook. However, the material on them is from the standard material for Exam 2 using the current textbook. Of course, other material is also on the syllabus for our Exam 2; see for example the "Study Guide" on the main course web page. The exams below give at least an idea of the usual length and difficulty of the problems on a typical Exam 2.

Exam 2 given by Prof. Y. Liu: March 2, 2001.

1) Which of the following statements are true for all positive values of a and b? (Briefly explain your reason for each TRUE or FALSE answer).

a) $(a+bi)(a-bi) = a^2 - b^2$; b) $e^{a+b} = e^a + e^b$; c) $\sqrt{a-b} = \sqrt{a} - \sqrt{b}$;

d) $\dfrac{\ln(a \cdot b)}{\ln(b)} = \ln(a)$; e) $\log(\frac{1}{a}) + \log(a) = 0$.

2) For the rational function $f(x) = \dfrac{3x-2}{4x+5}$,

a) Find all x-intercept(s). b) Find the y-intercept. c) Find the vertical asymptote. d) Find the horizontal asymptote. e) Using the above information, sketch a graph of the rational function $f(x)$, labeling all of the above on the graph.

3) Find a polynomial $P(x)$ of degree 5 with real coefficients, that has -1 as a root of multiplicity 1, has 3 as a root of multiplicity 4, and satisfies $P(5) = 32$.

4) The number of students at a local high school who are infected with flu after t days is modeled by the function

$$P(t) = \frac{1200}{1 + 99e^{-0.4t}}.$$

a) What was the initial number of infected students?

b) When will 200 students be infected ?

5) How many years will it take for an investment to double in value, when interested is earned at an annual rate of 5.25%, compounded continuously?

6) Find all roots, real and complex, of $x^3 - 5x^2 + 8x - 6$.

7) Find all solutions to the equation $\ln(x-6) + \ln(x) = \ln(7)$.

Exam 2 given by Prof. H. Colman: October 12, 2001.

1) Solve the inequality $\dfrac{7x+2}{-x+2} \geq 0$. Show all work.

2) Let $R(x) = \dfrac{x^2+5x-6}{7x^2-5x-2}$.

a) Find the vertical asymptote(s). b) Find the x-coordinates of any hole(s).

c) Find the horizontal asymptote.

3) Find a polynomial $f(x)$ of degree 3 with real coefficients that has roots that include -3 and i, and which satisfies $f(1) = 2$.

4) Simplify: $(a^{\frac{1}{3}}b^{-\frac{2}{3}})(a^{\frac{1}{3}}b^{\frac{1}{3}})^2$.

5) Solve the equation $\sqrt{-x+13} = x - 1$. Show your work.

6) Solve the following equation: $e^{5x} = 3$. First express your answer in terms of natural logarithms. Then use your calculator to approximate to 4 decimal places.

7) The number of people suffering from a disease is given by a function

$$N(t) = \frac{3000}{10 + 20e^{-0.5t}},$$

where t is the number of days after the start of the disease.

a) How many people had the disease at the start?

b) After how many days will there be 150 people with the disease?

8) Find all roots (both real and complex) of $f(x) = x^3 + 64$.

9) Write as a single logarithm: $5\ln(x^3) - 6\ln(x^2) + 2\ln(x^3)$.

10) Evaluate $\log(10^4)$.