For more information and practice, see the course OpenLab blog

Instructions: These problems are for you to use to test yourself, **after** you have practiced with the routine homework assignments, to see how ready you are for Test 3. They are not meant as a substitute for regular and diligent practice!

Do the following problems as if you were taking a test: without notes or textbook, and give yourself a time limit as stated at the start of each self-test. At the end of that time, check your answers Then review as needed before you repeat the self-test. Make sure that you are correctly using methods taught in class.

Self-Test A - allow 60 minutes

1) For the rational function

$$f(x) = \frac{6x^2}{x^2 - 3x - 10}$$

Find **algebraically** the domain, the x- and y-intercepts, and the equations of the vertical and horizontal asymptotes; and then sketch a complete graph of the function.

2) Solve the inequality and give your answer in interval form:

$$\frac{6x^2}{x^2 - 3x - 10} \geq 0$$

3) Solve the inequality and give your answer in interval form:

$$x^3 + 9x < 6x^2$$

4)) Evaluate without using a calculator: explain your answer $\ln(e^{2/3})$

5) Write as a single logarithm: $3\ln x - 4(\ln x^3 - 5\ln x)$

6) Which of the following statements are true? Explain your answers.

a) $\ln 10 = (\ln 2)(\ln 5)$

b) $\ln(e/6) = \ln e + \ln 6$

c) $\ln(1/7) + \ln 7 = 0$

d) $\ln(-e) = -1$

7) Solve for x: round your answer to the nearest thousandth. $248e^{-3x} = 620$

8) Solve for x: give the exact solution, and then approximate to the nearest thousandth. $4^x = 5^{2x+1}$

9) An insect colony grows exponentially from 100 to 1500 in 2 months time after we start observing it.

a) Find the formula for the size of the colony at t months after we start observing it.

b) What is the size of the colony 4 months after we start observing it?

c) If this growth pattern continues, how long from the time we start observing it will it take the insect population to reach 100,000?

10) Find the domain and sketch a complete graph of $f(x) = \log(x - 3) - 2$

Self-Test B - allow 60 minutes

1) For the rational function

$$f(x) = \frac{5}{(x+2)^2(x-1)}$$

Find **algebraically** the domain, the x- and y-intercepts, and the equations of the vertical and horizontal asymptotes; and then sketch a complete graph of the function.

2) Solve the inequality and give your answer in interval form:

$$\frac{x^2 - 4x}{2x^2 - 18} \leq 0$$

3) Solve the inequality and give your answer in interval form:
$x^3 - 5x^2 + 6x > 0$

4) Evaluate without using a calculator: explain your answer $\ln \sqrt[4]{e^5}$

5) Evaluate without using a calculator: explain your answer $e^{\ln(x/2)}$

6) Rewrite $\log\left(\frac{\sqrt{x^3}}{y^5}\right)$ in terms of the elementary logarithms $u = \log x$ and $v = \log y$. Assume that $x > 0$ and $y > 0$.

7) Which of the following statements are true? Explain your answers.

a) $10(\log 5) = \log 50$

b) $\log 100 + 3 = \log 10^5$

c) $\log 1 = \ln 1$

d) $\frac{\log 6}{\log 3} = \log 2$

8) Solve for x without using a calculator: $9^{9-x} = 3^{x^2-5x}$

9) Solve for x without using a calculator (exact solutions): $\ln x + \ln(3x + 5) = \ln 2$

10) The amount of a certain radioactive element in a sample is decreasing exponentially at a a rate of 1.5% per year. In what year will the amount of that radioactive element left in the sample be 60% of what it was in 2012?