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

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

Algebraically find 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:

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

- 3) Solve the inequality and give your answer in interval form: $x^3 - 5x^2 + 6x > 0$
- 4) Find the domain, the x-intercept, and the equation of the asymptote, and draw a complete graph of $f(x) = \ln (2 x)$
- 5) 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.
- 6) The amount of a certain radioactive element in a sample is decreasing exponentially at a a rate of 1.5% per year. If we start with 100 grams of the substance at the beginning of the year 2018, in what year will there be 60 grams remaining?

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Self-Test B - allow 60 minutes

1) For the rational function

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

, **Algebraically** find 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:

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

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

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

- 4) Find the domain, the x-intercept, and the equation of the asymptote, and sketch a complete graph of $f(x) = \log (x 3) 2$
- 5) Rewrite $\ln\left(\sqrt{\frac{x^3}{y}}\right)$ in terms of the elementary logarithms $u = \ln(x)$ and $v = \ln(y)$. Assume that x > 0 and y > 0.
- 6 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?