Math-71 Sections 9, 11, 12

Exam #2

Name: _____

This exam is closed book and notes. You may use a scientific calculator; however, no other electronics are allowed. You may also use the instructor-provided cheatsheet. Show all work; there is no credit for guessed answers. Simplify your answers unless told otherwise. In particular, all answers should contain no negative or rational exponents. All numerical answers should be in exact form unless you are specifically asked for a decimal value.

1. Determine $f'(x)$. You do not need to simplify.

   $f(x) = e^{\sqrt{x^2+1}}$

2. Let $f(x) = x^3 - 3x^2 - 24x + 1$

   (a) What is the y-intercept?

   (b) Find all critical points for the first derivative.

   (c) Use the second derivative test to determine whether these critical points are minima, maxima, or points of inflection.

(d) Use the second derivative to find any points of inflection.

(e) Sketch the graph, showing and labeling all extrema, points of inflection, and the y-intercept. You do *not* need to determine the x-intercepts.

3. Let $y = -2e^{x-1} + 3$.

   (a) List the transformations in the proper order.

   (b) What are the coordinates of the final key point?

   (c) What is the equation of the final horizontal asymptote?

(d) What are the x-intercepts (if any)?

(e) What are the y-intercepts (if any)?

(f) Sketch the graph, showing and labeling the key point, horizontal asymptote, and all intercepts.

4. You buy a new home for $500,000 on the first day of the month. You put down $50,000 and finance the rest with a mortgage at 6% annual interest compounded monthly on the last day of the month. Your monthly payments, including principal and interest, are $2500. Your payments are due on the first of the month, starting next month. What is your loan balance after your third monthly payment?

5. You are testing the duration of certain fuses for a pyrotechnic company. The manufacturer states that the duration (from ignition to explosion) follows a normal distribution as follows, where the mean and standard deviation are expressed in seconds:

$$p(x) = \frac{1}{2\sqrt{2\pi}} e^{\frac{-(t-10)^2}{8}}$$

(a) What is the mean of the fuse duration?

(b) What is the standard deviation of the fuse duration?

(c) At what t value does the corresponding bell curve have its absolute maximum?

(d) At what t values does the corresponding bell curve have its points of inflection?

(e) What is the probability that a fuse duration will be between 8 and 12 seconds?