Math-71 Sections 9, 11, 12

Practice Exam #2

This exam will be 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.

   $$f(x) = 2e^{\sqrt{3x^2-1}}$$

2. Let $f(x) = x^3 - 12x + 5$

   (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 $y = -5e^{x+2} + 3$.

   (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. It's time for you to retire! You have \$1,200,000 in your 401(k) that is earning about 6% per year, compounded monthly on the first day of each the month. Since you are also collecting social security, you decide that you only need to withdraw about \$5000 per month, which you will withdraw on the second day of each month, starting in the first month. What is your account balance on the third day of the fifth month?

5. You are working quality control for a manufacturer of screws. You are sampling a particular screw as it comes off of the line. You expect the length of the screw to follow a normal distribution as follows, where the mean and standard deviation are expressed in centimeters (cm):

$$p(x) = \frac{1}{0.1\sqrt{2\pi}} e^{-50(t-2)^2}$$

   (a) What is the mean of the screw length?

   (b) What is the standard deviation of the screw length?

   (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 screw length will be between 1.8 and 2.2 cm?