

Math-19 Homework #6

Reading

Please read sections 2.8 and 4.1 through 4.7 and do all concept problems in the posted sections on webassign.

Problems

- 1). You use \$1000 to open a savings account at your local bank on the first of February. The savings account has an interest rate of 1.5% per year and compounds monthly on the last day of the month. You set up an auto-deposit of \$100 from your paycheck to occur on the first of each month, starting with the second month (March). During April, you withdraw \$250 to purchase a new gameboy (gotta catch em all!).
 - a). Who is the lender and who is the borrower?
 - b). Calculate $x = 1 + \frac{r}{n}$
 - c). Construct a polynomial in x to determine the account value on July 2.
 - d). What is the account value on July 2?
- 2). Consider the circle $x^2 + y^2 = r^2$ and remember that we needed to restrict the range in order to obtain the function $y = \sqrt{r^2 - x^2}$.
 - a). Sketch the half-circle function and demonstrate why it is not one-to-one?
 - b). Suggest a how to limit the domain so that it is a one-to-one function.
 - c). Sketch the new graph for the one-to-one function and state its domain and range.
 - d). By observing the graph (and the line $y = x$), predict something about the inverse function.
 - e). Derive the inverse to prove your prediction.
- 3). Consider the equation: $y = \log_a x$
 - a). Derive the change of base formula for some arbitrary base b .
 - b). Use your formula with $b = e$ and your calculator to compute $\log_7 100$.
 - c). Assume that you made a mistake and used the common log key instead of the natural log key in the above calculation. Would you get a different answer? Why or why not?

- 4). Researchers tend to prefer exponential (base e) equations. For example, the normal equation for the radioactive decay of Carbon-14, which has a half-life of 5730 years, would be:

$$A = A_0 \cdot 2^{-\frac{t}{5730}}$$

But the preferred exponential equations is:

$$A = A_0 e^{-\frac{t}{8267}}$$

Prove that these two equations are equivalent.

- 5). The San Francisco earthquake of 1906 was estimated at 7.6 on the Richter Scale. Current building codes have resulted in skyscrapers that can withstand an 8.0 earthquake. How much stronger is this than the 1906 quake?