14 Radicals, Rational Exponents & Exponential Functions

Concepts:

- The nth root.

- Rational and Irrational Exponents.

- Radicals.

- Application.

- Exponential Functions

  - Power Functions vs. Exponential Functions
  - The Definition of an Exponential Function
  - Graphing Exponential Functions
  - Exponential Growth and Exponential Decay

- The Irrational Number e and Continuously Compounded Interest

(Section 5.1 & 5.2)

1. **The following are all FALSE.** Change each to make the statement true.

   (a) $\sqrt{c^2} = c$ for all real numbers c.

   (b) $(x^2)^3 = x^5$

   (c) The equation $x^n = c$ has exactly one solution when n is even and $c \geq 0$.

2. Write each expression with out using radicals.

   (a) $\dfrac{1}{\sqrt[3]{x^2}}$

   (b) $\sqrt[5]{t}\sqrt{16t^5}$

   (c) $\sqrt{\sqrt[3]{a^3b^4}}$

3. Simplify and express answers exactly (no decimal approximations).

   (a) $\sqrt[3]{40}$

   (b) $256^{-3/4}$

   (c) $\sqrt{16a^8b^{-2}}$.

   (d) $\dfrac{(x^2)^{1/3}(y^2)^{2/3}}{3x^{2/3}y^2}$

4. Compute and simplify your answer.

   (a) $x^{2/3}(x^{5/2} + y^{1/2})$

   (b) $(x^{1/2} - y^{1/2})(x^{1/2} + y^{1/2})$

5. Rationalize the denominator and simplify.

   (a) $\dfrac{5}{\sqrt{x}}$

   (b) $\dfrac{1-x}{1-\sqrt{x}}$

6. If \$10,000 is invested at an interest rate of 4% per year, compounded quarterly, find the value of the investment after the given number of years.

   (a) 5 years

   (c) 15 years

   (b) 10 years

   (d) 20 years

7. If \$10,000 is invested at an interest rate of 3% per year, find the amounts in the account after 3 years if interest is compounded

   (a) quarterly

   (b) monthly

   (c) daily

8. Joni invests \$5000 at an interest rate of 5% per year compounded continuously. How much time will it take for the value of the investment to quadruple.

9. Between 1790 and 1860, the population y of the United States (in millions) in the year x was given by $y = 3.9572(1.0299^x)$, where x is the number of years since 1790. Find the population in the year 1858. (The question similar to this on Webassign expects your answer to be expressed as an actual number, not in units of 1,000,000.)

10. According to the *Kelly Blue Book*, the factory invoice price of a 2010 Buick LaCrosse 4-door CX Sedan is \$25,945.21 and the MSRP is \$26,995.00. (The factory invoice price is the price the dealer pays to the factory. The MSRP is the Manufacturer's Suggested Retail Price.) A certain dealership is charging the MSRP for the LaCrosse, but they need to clear their inventory to make room for the 2011 models. They decide to reduce the price of the car by 1% every day after October 21, 2010. (On October 22, they reduce the price by 1%; on October 23, they reduce the *reduced* price by 1%; etc.)
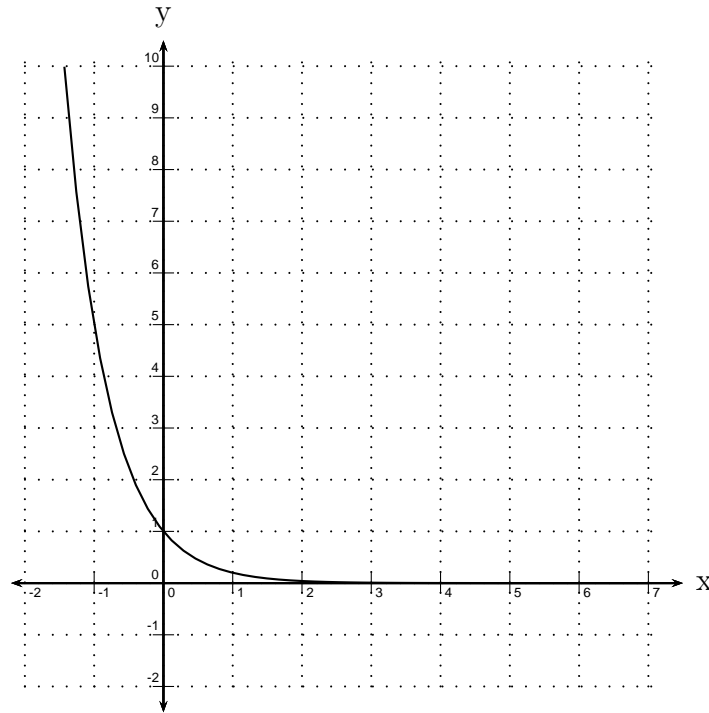
   (a) What will the price of the car be on October 23, 2010?

   (b) Find a function that models the price p of the car t days after October 21, 2010.

   (c) Will the car ever be free?

   (d) On what date does the dealer start to lose money?

11. The graph of g is shown below. Find a formula for $g(x)$.

12. Iodine-131 (I-131) is a radioactive element used in the treatment of thyroid cancer. The half-life of I-131 is about 8.0197 days. A clinical trial is being conducted to determine the best dosage of radioactive iodine for thyroid cancer patients. The patients in group I were given a dose of 1110 MBq, and those in group II were given a dose of 3700 MBq.

(a) Find a model to represent the amount of radioactive iodine in a patient's body t days after receiving treatment:

    i. for a patient in group I.

    ii. for a patient in group II.

(b) Suppose that Sue is a patient in group I.

    i. How much I-131 is in Sue's body, 3 days after treatment?

    ii. When will the amount of I-131 in Sue's body reach a level of 100 MBq?

(c) Suppose that Alice is a patient in group II.

    i. How much I-131 is in Alice's body, 3 days after treatment?

    ii. When will the amount of I-131 in Alice's body reach a level of 1100 MBq?

    iii. When will the amount of I-131 in Alice's body reach a level of 100 MBq?

13. Label each of the following graphs with at least one of the following categories: Linear, Quadratic, Polynomial, Rational, Exponential, or None of the Categories Studied So Far. Some graphs may have more than one label.