9 May 2018 Name: .

Classwork: Pretest polynomial functions

1. Determine whether the binomial $x + 3$ is a factor of $f(x) = 3x^3 + 10x^2 - x - 12$.

2. Given $r(x) = x^3 - 4x^2 + 4x - 6$, find the value of $r(2)$. What does your answer tell you about $x - 2$ as a factor of $r(x)$? Explain.

3. A manufacturing company has developed a cost model, $C(x) = 0.15x^3 + 0.01x^2 + 2x + 120$, where x is the number of items sold, in thousands. The sales price can be modeled by $S(x) = 30 - 0.01x$. Therefore, revenue is modeled by $R(x) = x \cdot S(x)$.

   The company's profit, $P(x) = R(x) - C(x)$, could be modeled by what polynomial?

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4. A bank account earns interest at a continuous interest rate of 4% per year. The initial deposit is $175.

   (a) Express the balance in the account as a function in the form $P(t) = P_0 \cdot e^{rt}$

   (b) Convert the function to one without a coefficient in the exponent.

   (c) What is the interest rate expressed as a simple, annual rate?

5. Judith puts $2500 into an investment account with interest compounded continuously. If the annual interest rate is 2.15% what is the balance after 20 years?

6. The function below models the average price of gas in a small town since January 1st.

$$G(t) = 0.0812t^3 - 0.75t^2 + 1.25t + 3.23, \text{ where } 0 \leq t \leq 5.$$

   If $G(t)$ is the average price of gas in dollars and t represents the number of months since January 1st, the absolute maximum $G(t)$ reaches over the given domain is about what value, to the nearest cent? (graph the function in your calculator and use the Max function)

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7. Write $\sqrt[3]{x^{-5}}$ as a single term with a rational exponent.

8. Write $\sqrt{a^4} \div a^{\frac{1}{2}}$ as an expression with positive, integer exponents.

9. If $n = \sqrt{z^3}$ and $m = z$, where $a > 0$, express $\frac{n}{m}$ as

   (a) a radical with positive, integer exponents

   (b) an expression with a fractional exponent

10. What is the expression $2i^3(-3i + 7)$ is equivalent to? Express your answer in the form $a + bi$, where $a, b \in \mathbb{R}$.

11. Simplify the expression $(1x - 3i)^2$, where i is the imaginary unit. Express your answer in the form $a + bi$, where $a, b \in \mathbb{R}$.

12. Algebraically determine the values of h and k to correctly complete the identity stated below.

$$3x^3 - 7x^2 + 5x - 5 = (x - 2)(3x^2 + hx + k)$$

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13. The expression $(x + a)(x + b)$ can not be written as

    (a) $a(x + b) + x(x + b)$

    (b) $x^2 + (a - b)x + ab$

    (c) $x^2 + (a + b)x + ab$

    (d) $x(x + a) + b(x + a)$

14. What is the quotient and the remainder when $3x^3 + 8x^2 + 7x + 3$ is divided by $x + 2$?

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15. Judith puts \$1000 into an investment account with interest compounded continuously. What is the approximate annual rate is needed for the account to grow to \$1529.59 after 10 years?

16. The function $p(t) = 110e^{0.03922t}$ models the population of a city, in millions, t years after 2010.

    (a) Initially, as of 2010, what is the population in millions.

    (b) What is the rate that the population increases continuously, per year?

    (c) Express the population as a function with the form $p(t) = Ab^t$, where A and b are real numbers.

17. For a given time, x, in seconds, an electric current, y, can be represented by $y = 2.7^{-.10x}$.

    (a) Simplify the expression to eliminate the coefficient in the exponent.

    (b) Is the electric current increasing or decreasing? Justify your answer.

    (c) Is the current in the original equation, above, exponential growth or decay? Why?

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18. Iridium-192 is an isotope of iridium and has a half-life of 73.83 days. If a laboratory experiment begins with 100 grams of Iridium-192, the number of grams, A, of Iridium-192 present after t days would be

$$A = 100\left(\frac{1}{2}\right)^{\frac{t}{73.83}}$$

(a) Simplify the equation to eliminate the fraction in the exponent.

(b) After one day, how much isotope is present?

(c) As a percentage, how much does the mass of the isotope change each day?