BECA / Dr. Huson / IB Math SL
17 January 2018
Classwork: Regents exponents problems Name:

## Rational exponents and radicals

1. Write $\sqrt[6]{x} \cdot \sqrt{x}$ as a single term with a rational exponent.

2. True of false: $\left(27^{\frac{2}{9}}\right)$ can be written as the equivalent radical expression $\sqrt[3]{9}$

3. For $x \neq 0$, which expressions are equivalent to one divided by the sixth root of $x$?

$$\text{I. } \frac{\sqrt[6]{x}}{\sqrt[3]{x}} \quad \text{II. } \frac{x^{\frac{1}{6}}}{x^{\frac{1}{3}}} \quad \text{III. } x^{-\frac{1}{6}}$$

## Polynomial algebra procedures

4. Simplify $(x-3)(-2x^2+5x+1)$

5. Is 3 a zero of the function $f(x) = x^3 - 2x - 20$?

6. 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.

7. 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?

## Graphing calculator solutions

8. Given $f(x) = 3|x| - 1$ and $g(x) = 0.03x^3 - x + 1$. Graph the two functions and make a quick sketch. Find the two solutions for the equation $f(x) = g(x)$, stating them as ordered pairs rounded to the nearest hundredth.

## Function transformations

9. Given the parent function $p(x) = \cos x$, which phrase best describes the transformation used to obtain the graph of $g(x) = cos(x + a) - b$, if $a$ and $b$ are positive constants?
(1) right $a$ units, up $b$ units
(2) right $a$ units, down $b$ units
(3) left $a$ units, up $b$ units
(4) left $a$ units, down $b$ units

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## Exponential models, base change

10. A student studying public policy created a model for the population of Detroit, where the population decreased 25% over a decade. He used the model $P = 714(0.75)^d$, where $P$ is the population, in thousands, $d$ decades after 2010. Another student, Suzanne, wants to use a model that would predict the population after $y$ years. Suzanne's model is best represented by
(1) $P = 714(0.6500)^y$ (3) $P = 714(0.9716)^y$
(2) $P = 714(0.8500)^y$ (4) $P = 714(0.9750)^y$

11. A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where $h$ is the constant representing the number of hours in the half-life, $A_0$ is the initial mass, and $A$ is the mass $t$ hours after 3 p.m.

    Using this equation, solve for $h$, to the *nearest ten thousandth.*

    Determine when the mass of the radioactive substance will be 40 g. Round your answer to the nearest tenth of an hour.

## Logarithms

12. What is the $\log_3 27$?

13. Simplify $\ln 18 - \ln 2$

14. What is the exact solution to $8(2^{x+3}) = 48$?

## Imaginary numbers

15. Simplify $9i + (2i)^3$

16. Use the quadratic formula to find the solution to the equation $4x^2 + 98 = 0$.

17. The expression $6xi^3(-4xi + 5)$ is equivalent to...

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18. Algebraically determine the values of $h$ and $k$ to correctly complete the identity stated below.
$$2x^3 - 10x^2 + 11x - 7 = (x - 4)(2x^2 + hx + 3) + k$$

19. Given the exponential function $f(x) = 17e^{(0.15x)}$.
    (a) Write down $f(0)$.
    (b) Find $f(2)$.
    (c) Solve for $x$ such that $f(x) = 25$.

20. Express $(1 - i)^3$ in $a + bi$ form.