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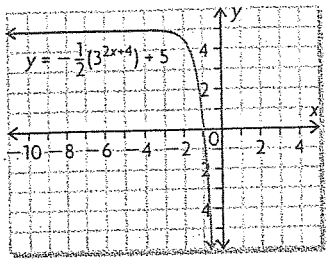
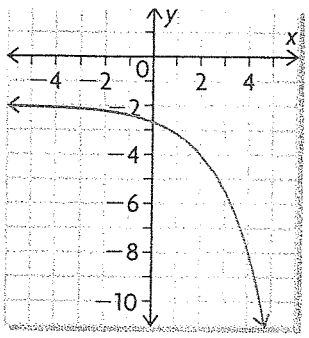
1. a) There is a variable in the exponent part of the equation, so it's an exponential equation.
   b) You can tell by the second differences.
   c) reflection in the x-axis, vertical compression of $\frac{1}{2}$, horizontal compression by a factor of 2, and translations of 4 left and 5 up



2. a) $-\frac{1}{125}$
   b) 9
3. a) $-243y^5$
   b) $\frac{1}{3125a^3b}$
   c) $2x$
   d) $\frac{1}{4xy^4}$
4. a) $I = 100(0.964)^n$
   b) 89.6%
   c) As the number of gels increases the intensity decreases exponentially.
5. a) $P = 2(1.04)^n$, where P is population in millions and n is the number of years since 1990
   b) 18 years after 1990 or in 2008
6. (d)
7. $n \neq 0$; n must be odd because you cannot take even roots of negative numbers.



Unit 1 Review

1. The function $f(x) = -\frac{1}{2}(3^{2x+4}) + 5$ is the transformation of the function $g(x) = 3^x$.
   a) Explain how you can tell what type of function $f(x)$ represents just by looking at the equation.
   b) Create a table of values for $f(x)$. Describe how to tell the type of function it is from its table of values.
   c) Describe the transformations necessary (in the proper order) that map $g(x)$ onto $f(x)$. Sketch $f(x)$ and state the equation of its asymptote.

2. Evaluate. Express answers as rational numbers.
   a) $(-5)^{-3}$
   b) $27^{\frac{2}{3}}$

3. Simplify. Use only positive exponents in your final answers.
   a) $(-3x^2y)^3(-3x^{-3}y)^2$
   b) $\frac{(5a^{-1}b^2)^{-2}}{125a^5b^{-3}}$
   c) $\sqrt[5]{\frac{1024(x^{-1})^{10}}{(2x^{-3})^5}}$
   d) $\frac{(8x^6y^{-3})^{\frac{1}{3}}}{(2xy)^3}$

4. A spotlight uses coloured gels to create the different colours of light required for a theatrical production. Each gel reduces the original intensity of the light by 3.6%.
   a) Write an equation that models the intensity of light, I, as a function of the number of gels used.
   b) Use your equation to determine the percentage of light left if three gels are used.
   c) Explain why this is an example of exponential decay.

5. A small country that had 2 million inhabitants in 1990 has experienced an average growth in population of 4% per year since then.
   a) Write an equation that models the population, P, of this country as a function of the number of years, n, since 1990.
   b) Use your equation to determine when the population will double (assuming that the growth rate remains stable).

6. Which of these equations correspond to the graph. Explain how you know.
   a) $f(x) = 2(3^{-x}) + 5$
   b) $g(x) = (3^{-2x-4}) - 5$
   c) $h(x) = -0.8(3^{x-3})$
   d) $p(x) = -2\left(3^{\frac{1}{2}x-1}\right) - 2$

7. What are the restrictions on the value of n in $a^{\frac{1}{n}}$ if $a < 0$? Explain.

1. Simplify.
   a) $(-x^2 + 2x + 7) + (2x^2 - 7x - 7)$
   b) $(2m^2 - mn + 4n^2) - (5m^2 - n^2) + (7m^2 - 2mn)$

2. Expand and simplify.
   a) $2(12a - 5)(3a - 7)$
   b) $(2x^2y - 3xy^2)(4xy^2 + 5x^2y)$
   c) $(4x - 1)(5x + 2)(x - 3)$
   d) $(3p^2 + p - 2)^2$

3. Is there a value of a such that $f(x) = 9x^2 + 4$ and $g(x) = (3x - a)^2$ are equivalent? Explain.

4. If Bonnie is away from Clyde for n consecutive days, then the amount of heartache Clyde feels is given by $h(n) = (2n + 1)^3$.
   a) If Bonnie is absent, by how much does Clyde's pain increase between day n and day $n + 1$?
   b) How much more pain will he feel on day 6 than on day 5?

5. Factor.
   a) $3m(m - 1) + 2m(1 - m)$
   b) $x^2 - 27x + 72$
   c) $15x^2 - 7xy - 2y^2$
   d) $(2x - y + 1)^2 - (x - y - 2)^2$
   e) $5xy - 10x - 3y + 6$
   f) $p^2 - m^2 + 6m - 9$

6. Use factoring to determine the x-intercepts of the curve $y = x^3 - 4x^2 - x + 4$.

7. Simplify. State any restrictions on the variables.
   a) $\dfrac{4a^2b}{5ab^3} \div \dfrac{6a^2b}{35ab}$
   b) $\dfrac{x - 2}{x^2 - x - 12} \cdot \dfrac{2x - 8}{x^2 - 4x + 4}$
   c) $\dfrac{5}{t^2 - 7t - 18} + \dfrac{6}{t + 2}$
   d) $\dfrac{4x}{6x^2 + 13x + 6} - \dfrac{3x}{4x^2 - 9}$

8. Mauro found that two rational functions each simplified to

$$f(x) = \frac{2}{x + 1}$$

   Are Mauro's two rational functions equivalent? Explain.

9. Roman thinks that he has found a simple method for finding the sum of the reciprocals of any three consecutive natural numbers. He writes, for example,

$$\frac{1}{3} + \frac{1}{4} + \frac{1}{5} = \frac{47}{60}, \quad \frac{1}{4} + \frac{1}{5} + \frac{1}{6} = \frac{74}{120}, \quad \text{or} \quad \frac{37}{60}$$

   Roman conjectures that before simplification, the numerator of the sum is three times the product of the first and third denominators, plus 2. Also, the denominator of the sum is the product of the three denominators. Is Roman's conjecture true?

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1. a) $x^2 - 5x$
2. a) $72a^2 - 198a + 70$
   b) $-7x^3y^3 + 10x^4y^2 - 12x^2y^4$
3. no
4. a) $24n^2 + 48n + 26$
5. a) $m(m - 1)$
   b) $(x - 3)(x - 24)$
   c) $(5x + y)(3x - 2y)$
6. $x = -1, 1, 4$
   b) $4m^2 - 3mn + 5n^2$
   c) $20x^3 - 57x^2 - 11x + 6$
   d) $9p^4 + 6p^3 - 11p^2 - 4p + 4$
   b) 866
   d) $(x + 3)(3x - 2y - 1)$
   e) $(y - 2)(5x - 3)$
   f) $(p - m + 3)(p + m - 3)$
7. a) $\dfrac{14}{3b^2}$, $a \neq 0, b \neq 0$
   b) $\dfrac{2}{(x - 2)(x + 3)}$, $x \neq -3, 2, 4$
   c) $\dfrac{6t - 49}{(t + 2)(t - 9)}$, $t \neq -2, 9$
   d) $\dfrac{-x^2 - 18x}{(3x + 2)(2x + 3)(2x - 3)}$, $x \neq -\dfrac{3}{2}, -\dfrac{2}{3}, \dfrac{3}{2}$
8. yes (as long as there are no restrictions that were factored out)
9. yes