Exponents Study Guide

Name: _____

Math 1

Date: _____ Block: ____

Directions: Simplify each expression. Use positive exponents.

1. $\left(\dfrac{y^5}{x^4}\right)^{-3}$

2. $\dfrac{p^3 q^{-1}}{q^2 r^{-6}}$

3. $\left(\dfrac{16x^{-4}}{32\,y^{-5}}\right)^2$

4. $(m^3 n^{-5} m^{-1})^{-3}$

5. $\left(\dfrac{3^2\, y^{-4}}{3^2\, x^0 y^2}\right)^2$

$\left(\dfrac{x^4 y^{-2}}{x^{-3} y^5}\right)^{-1}$

6. If $z = \tfrac{1}{2}$, which expression has the greatest value?

 a) $z^{-6} z^4$ b) $(z^{-2} z^5)^{-2}$ c) $(z^3)^5$ d) $-(z^2 z^{-4})^{-3}$

Simplify the following:

7. $\left(\dfrac{9a^{-3}}{18b^{-4}}\right)^2$

8. $\left(\dfrac{5^3 t^{-2}}{5^3 s^0 t^3}\right)^2$

9. $(x^{-2})^{-5}$

10. $(x^2 y^{-2})(xy)^4$

Write using rational exponents.

11. $\left(\sqrt[3]{3a}\right)^4$

12. $\dfrac{1}{\left(\sqrt{3k}\right)^5}$

13. $\left(\sqrt[3]{6x}\right)^4$

14. $\left(\sqrt[4]{m}\right)^3$

Write using radicals.

15. $(10n)^{\frac{3}{2}}$

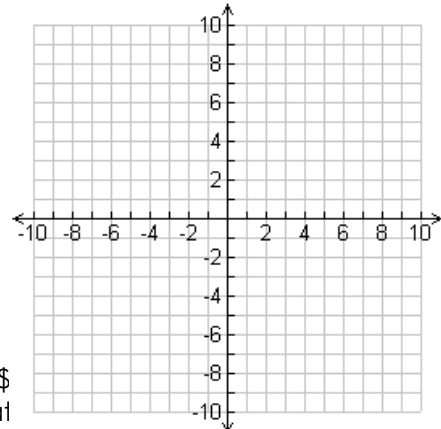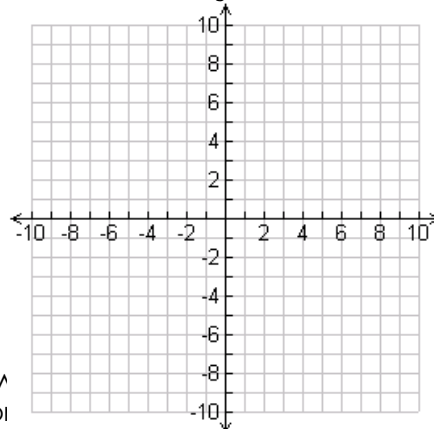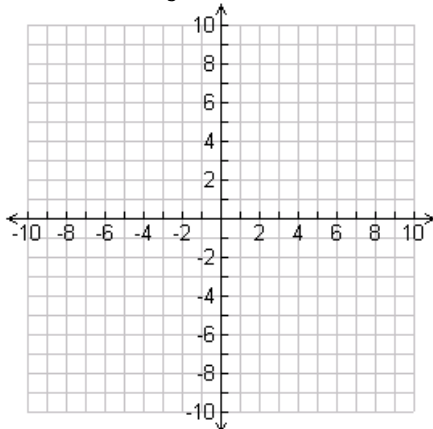16. $(27p^6)^{\frac{5}{3}}$

17. $(5x)^{-\frac{5}{4}}$

18. $a^{\frac{6}{5}}$

Graph each function. Make sure to draw a dotted line for the horizontal asymptote.

19. $f(x) = \dfrac{1}{3}\cdot 3^x - 2$

20. $y = 3 \cdot \left(\dfrac{1}{3}\right)^x + 2$

21. $y = 0.5^x + 3$

a. How much will the Honda be worth in 2012?

b. How much will the Ford be worth in 2015?

23. The function y = 195 • 0.75ˣ models the average time (in minutes) of math tests in 1980.
    a. Does the exponential function represent *growth* or *decay*?
    b. Estimate the average time for math tests in 1990.
    c. Predict the average time for math tests in 2025.

24. Find the balance in a bank account after 8 years if $500 is invested at 7% interest.

25. Find the balance in a bank account after 5 years if $2000 is invested at 6% interest.

26. On the first swing, a pendulum swings through an arc of length 60 cm. On each successive swing, the length of the arc is 82% of the length of the previous swing.
    a. Write a rule to model this situation.
    b. Find the length of the arc on the fifth swing. Round your answer to the nearest cm.

27. **Reasoning**: Does the table below represent an exponential function? Explain why or why not.

x	2	3	4	5
y	2.25	3.375	5.063	7.953

28.

Bacteria in a culture are growing exponentially with time, as shown in the table below.

Bacteria Growth

Day	Bacteria
0	100
1	200
2	400

Which of the following equations expresses the number of bacteria, y, present at any time, t?

a) $y = 100 + 2^t$ *b) $y = (100) \cdot (2)^t$ c) $y = 2^t$ d) $y = (200) \cdot (2)^t$

29.   This table shows the number of subscribers to four magazines.

Year	Subscribers to Music Magazine	Subscribers to Sports Magazine	Subscribers to Business Magazine	Subscribers to History Magazine
1	100,000	100,000	100,000	100,000
2	90,000	90,000	90,000	90,000
3	81,000	80,000	70,000	85,000
4	72,900	70,000	40,000	82,500

Which magazine's subscribers are *best* modeled by an exponential function?