

/27K	/10A	/8C	/9T	Total	/54
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Name: Answers Date: _____

MCR3U

Test: Exponential functions

/7
K

1. Evaluate each expression. Show your work and write your answers as fractions in lowest terms.

a) $(81)^{\frac{1}{4}}$

$$= \sqrt[4]{81}$$

$$= \pm 3$$

b) $2^{-1} + 3^{-2}$

$$= \frac{1}{2} + \left(\frac{1}{3}\right)^2$$

$$= \frac{1}{2} + \frac{1}{9}$$

$$= \frac{9}{18} + \frac{2}{18}$$

$$= \frac{11}{18}$$

c) $\left(\frac{-8}{27}\right)^{-\frac{2}{3}}$

$$= \left(\frac{27}{-8}\right)^{2/3}$$

$$= \left(\sqrt[3]{\frac{27}{-8}}\right)^2$$

$$= \frac{\sqrt[3]{27}^2}{\sqrt[3]{-8}^2}$$

$$= \frac{3^2}{(-2)^2}$$

$$= \frac{9}{4}$$

/7
K

2. Simplify each expression. Write your answers using only positive exponents.

a) $(x^6 y^3)^{\frac{1}{3}}$

$$= x^2 y$$

b) $5(4x)^2(2x^3)^{-1}$

$$= 5(4^2 x^2) \left(\frac{1}{2x^3}\right)$$

$$= \frac{5(16) x^2}{2x^3}$$

$$= \frac{40}{x}$$

c) $\frac{x^3}{x^{\frac{1}{2}}}$

$$= x^{3 - \frac{1}{2}}$$

$$= x^{\frac{6}{2} - \frac{1}{2}}$$

$$= x^{5/2}$$

/2
C

3. Explain how $9^{\frac{1}{2}}$ is different from 9^{-2} .

$$9^{\frac{1}{2}} = \pm\sqrt{9} = \pm 3$$

$$9^{-2} = \left(\frac{1}{9}\right)^2 = \frac{1}{81}$$

/2
C

4. Explain why the following statements is incorrect:

$$2^3 - 2^{-1} = 2^4$$

To subtract exponents as has been done here, you must be DIVIDING the two terms.

/4
K

5. Write an equation for the exponential function that results when the base graph $y = 5^x$ is

a) shifted right 3 units
and vertically reflected

$$y = -5^{x-3}$$

b) horizontally stretched by a factor of 4
and shifted down 1 unit

$$y = 5^{\frac{1}{4}x} - 1$$



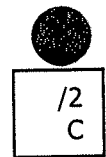
6. Is the graph of $y = \left(\frac{1}{2}\right)^{x-3}$ the same as the graph of $y = 2^{x-4}$? Justify your answer.

$$= 2^{-1} 2^{x-3}$$

$$= 2^{-1+x-3}$$

$$= 2^{x-4}$$

Yes!



7. Which statement is true? Justify your answer.

$$8(2^x) = 2^{x+3}$$

$$8(2^x) = 16^x$$

$$8(2^x) = 2^{4x}$$

$$8(2^x) = 2^3 2^x$$

$$= 2^{x+3}$$



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K

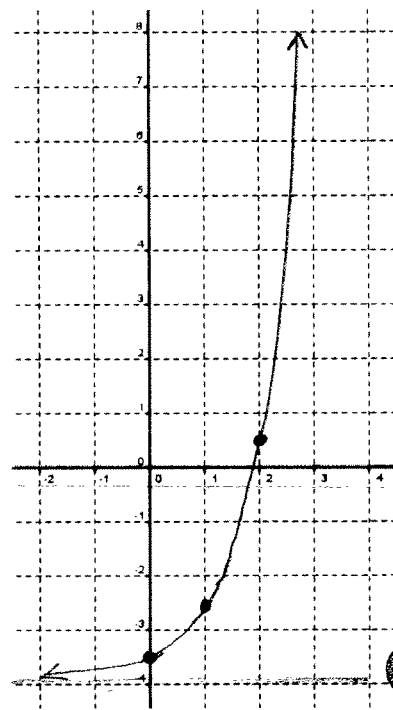
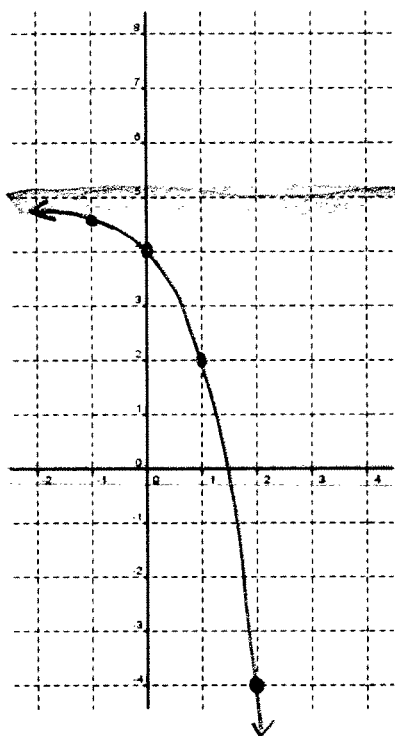
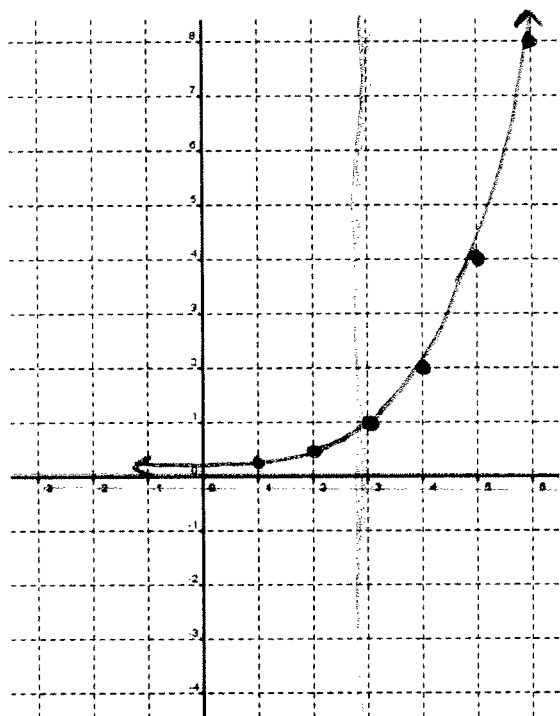
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T

8. Graph the following exponential functions. Mark all points accurately within the domain provided.

a) $y = 2^{x-3}$

b) $y = 5 - 3^x$
 $= -3^x + 5$

c) $y = \frac{1}{2}(3)^x - 4$



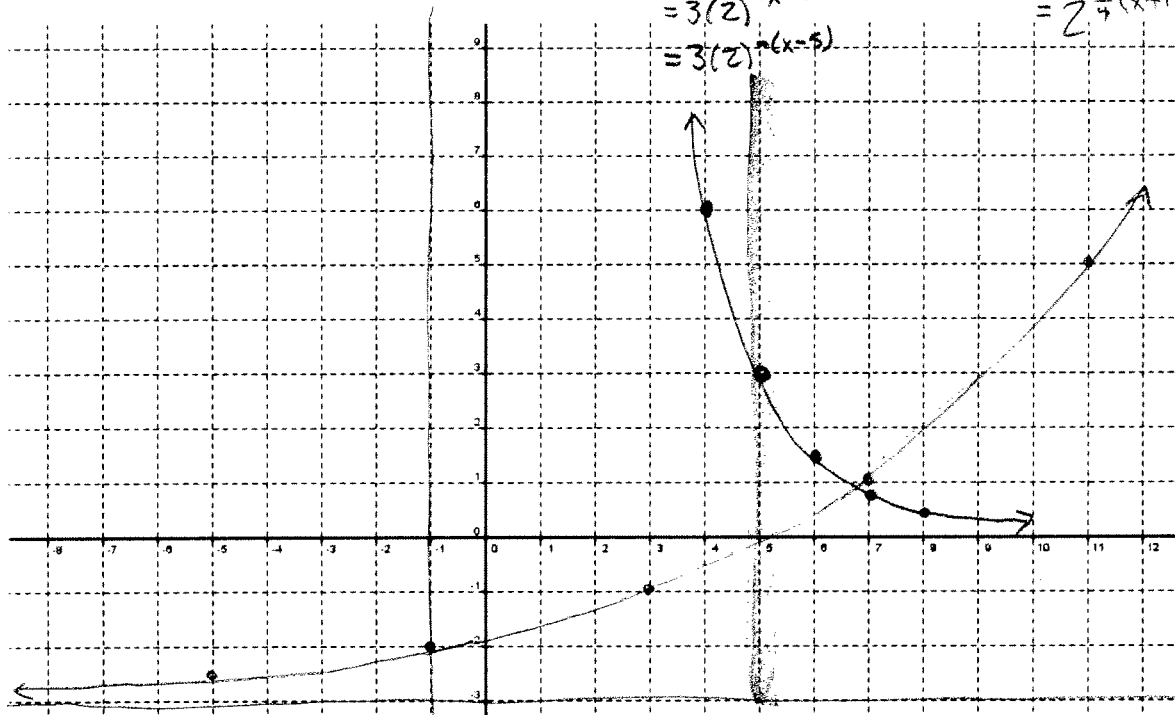
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T

9. Graph ONE of the following exponential functions by applying transformations to the base graph $y = 2^x$.

Show at least one intermediate transformation.

$f(x) = 3(2)^{5-x}$
 $= 3(2)^{-x+5}$
 $= 3(2)^{-(x-5)}$

or $g(x) = (2)^{\frac{x+1}{4}} - 3$
 $= 2^{\frac{1}{4}(x+1)} - 3$



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K

/3
T

10. Write equations for each of the following exponential functions.

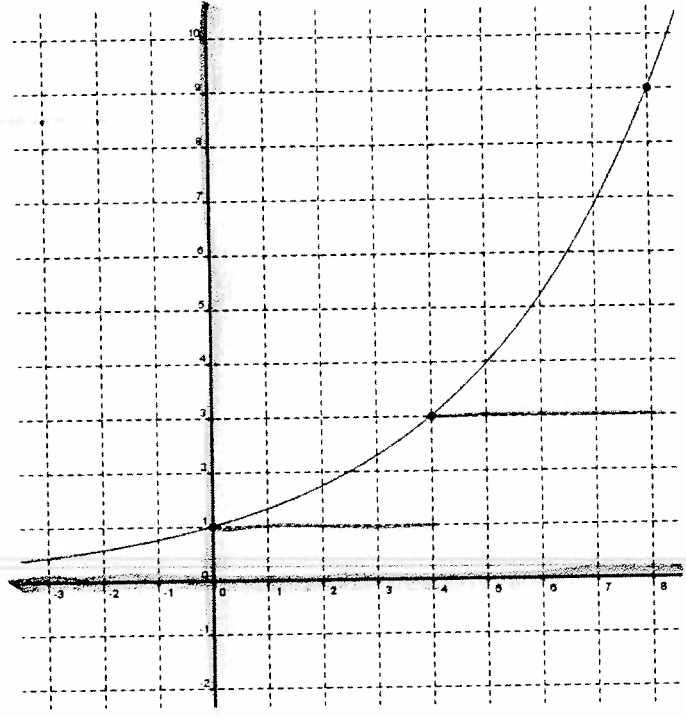
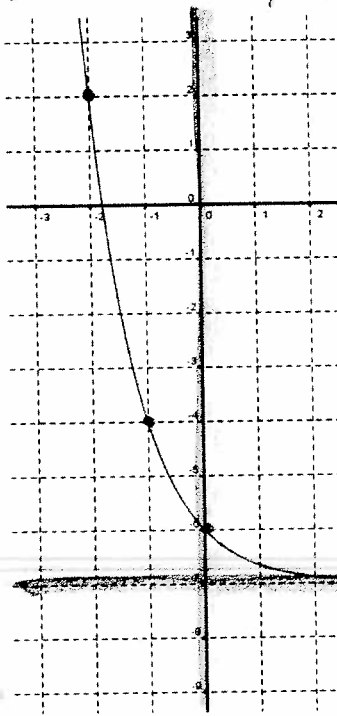
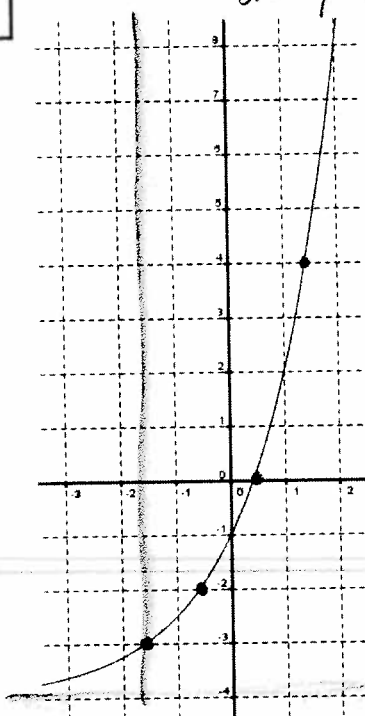
a) $y = 2^{x+1.5} - 4$

OR $y = 3(2)^x - 4$

b) $y = 3^{-x} - 7$

OR $y = (\frac{1}{3})^x - 7$

c) $y = 3^{\frac{1}{4}x}$



/3
A

11. Calculate the value of a Porsche 911 Turbo after 5 years if it sells initially for \$159 400 then depreciates at a rate of 18% per year.

$$V = 159400(0.82)^5$$

$$= \$59095.93$$

► 911 Turbo



Engine

368 kW (500 hp) at 6,000 rpm

Performance*

Top Track Speed: 312 kph

0-100 kph: 3.7 s

\$ 159,400.00

/4
A

12. A young entrepreneur deposits \$5000 into an account that offers 3.65% interest, compounded daily, for 90 days. Calculate the amount of interest earned by this investment.

$$\begin{aligned} A &= P(1+i)^n \\ &= 5000(1+0.0001)^{90} \\ &= \$5045.20 \end{aligned}$$

$$i = \frac{0.0365}{365} = 0.0001$$

$$n = 90$$

\therefore Interest collected is \$45.20

/3
A

13. Platinum-197 is a radioactive isotope with a half-life of 20 hours. Determine the amount of platinum-197 remaining in a 300 mg sample after 1 week.

$$\begin{aligned} A_t &= A_0 \left(\frac{1}{2}\right)^{t/h} \\ &= (300 \text{ mg}) \left(\frac{1}{2}\right)^{168/20} \\ &= 0.888 \text{ mg} \end{aligned}$$

$$1 \text{ week} = 168 \text{ hrs}$$