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SM3 Exponential Functions 2018-19

Date _____ Period _____

43

Approximate the value using a calculator. Express answer rounded to three decimal places.

1. $5^{2.71}$ 78.381

2. $e^{3.14}$ 23.104

3. 2.1^3 9.261

The graph of an exponential function is given. Match the graph to one of the following functions. Use transformations to find the answers. Do not use a calculator.

a) $y = 3^x$ a

b) $y = 3^{-x}$ b Reflect over y

c) $y = -3^x$ c Reflect over x

d) $y = -3^{-x}$ d Reflect over x/Reflect over y

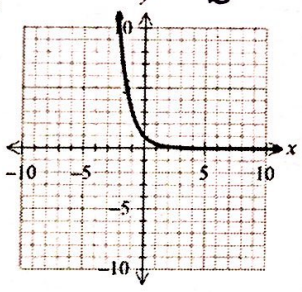
e) $y = 3^x - 1$ e down 1

f) $y = 3^{x-1}$ f Right 1

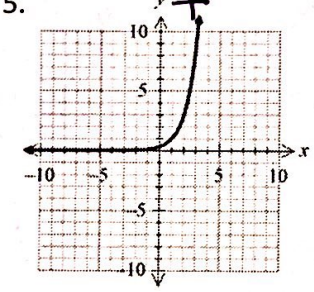
g) $y = 3^{1-x}$ g Reflect over y left 1

h) $y = 1 - 3^x$ Reflect over x/up 1 h

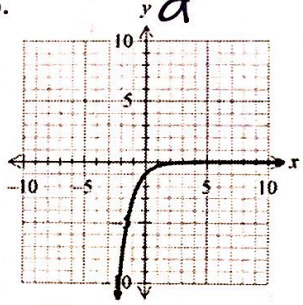
4. b



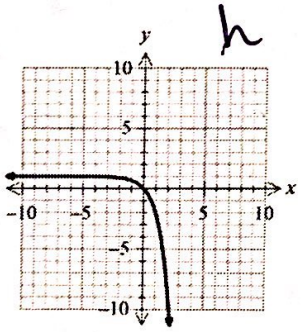
5. f



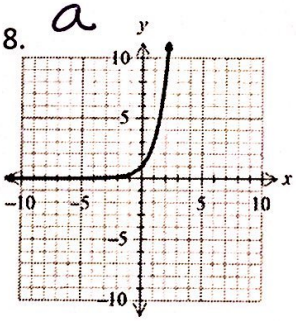
6. d



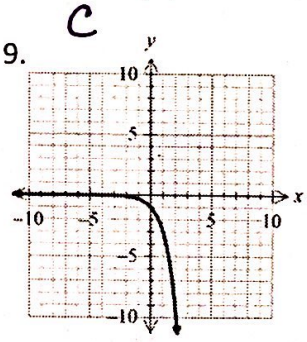
7. h



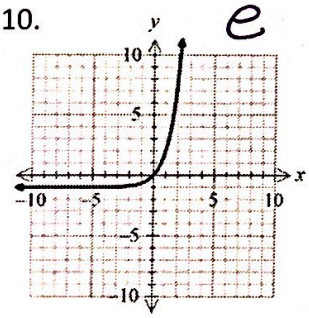
8. a



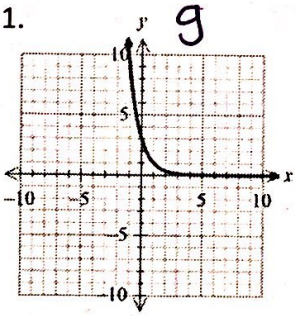
9. c



10. e



11. g



Use transformations and 3 key points to graph each function. Determine the domain, range, and horizontal asymptote of each function. Use a table! No Graphing Calculator! Show work!

12. $f(x)=2^x+1$ $a=2$

Domain: $(-\infty, \infty)$ 1pt

Asymptotes: $y=\phi$ 1pt

Key points and transformations: up 1 1pt

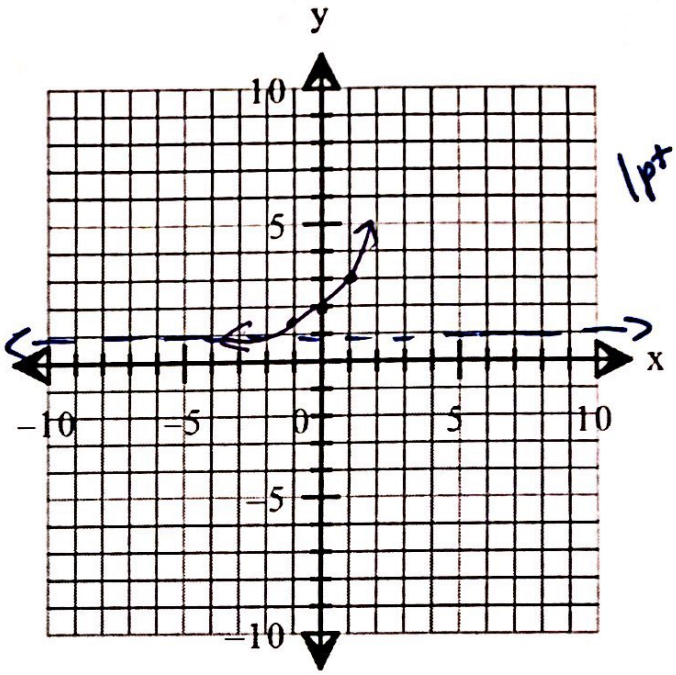
Parent

x	$f(x)$	
-1	$1/2$	$+1$
0	1	$+1$
1	2	$+1$

x	$f(x)$
-1	$3/2$
0	2
1	3

1pt

Range: (ϕ, ∞) 1pt



1pt

13. $f(x)=-3^{x-1}$ $a=3$

Domain: $(-\infty, \infty)$ 1pt

Asymptotes: $y=0$ 1pt

Key points and transformations: Reflect over x axis 1pt
Right 1

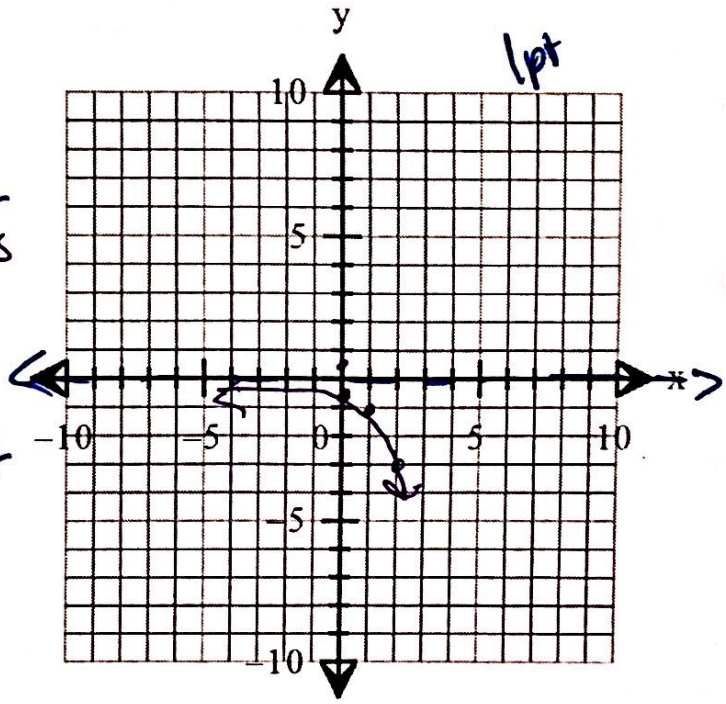
Parent

	x	$f(x)$	
1+	-1	$1/3$	$\cdot -1$
1+	0	1	$\cdot -1$
1+	1	3	$\cdot -1$

x	$f(x)$
0	$-1/3$
1	-1
2	-3

1pt

Range: $(-\infty, 0)$ 1pt



1pt

14. $f(x)=3^{x/2}+2$ $a=3$

Domain: $(-\infty,\infty)$ 1pt

Asymptotes: $y=2$ 1pt

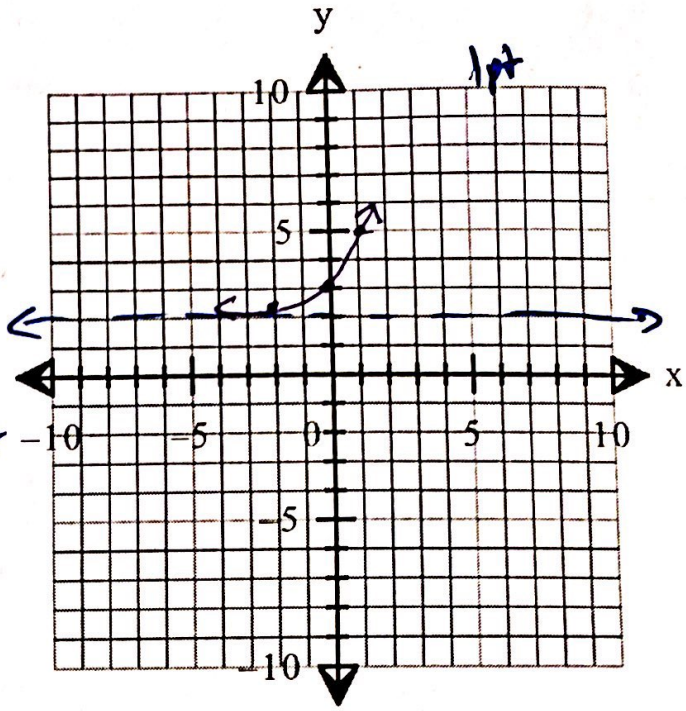
Key points and transformations: mult. x by 2 1pt; up 2

Parent

x	$f(x)$	
-1	1/3	+2
0	1	+2
1	3	+2

x	$f(x)$
-2	2 1/3
0	3
2	5

1pt



1pt

Range: $(2,\infty)$ 1pt

15. $f(x)=2^{-x}-3$ $a=2$

Domain: $(-\infty,\infty)$ 1pt

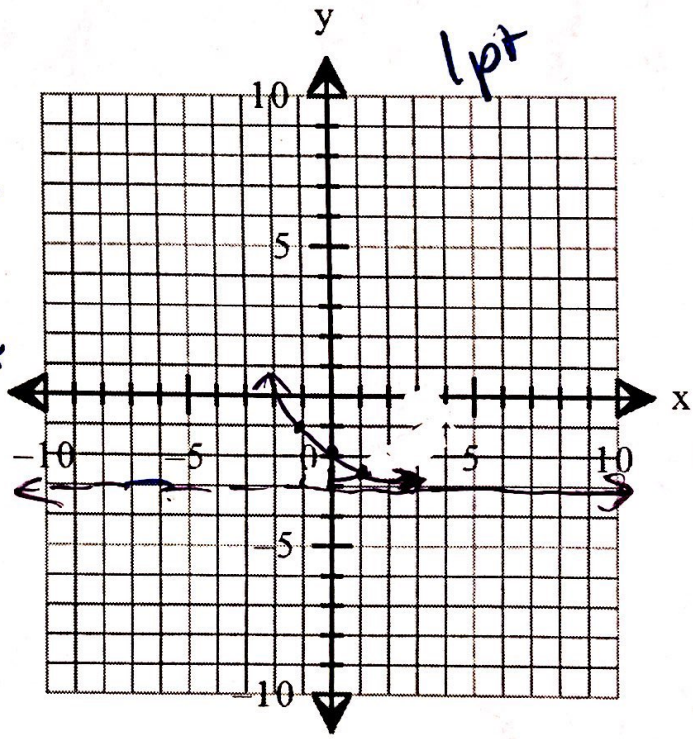
Asymptotes: $y=-3$ 1pt

Key points and transformations: Reflect over y axis 1pt; down 3

x	$f(x)$	
-1	1/2	-3
0	1	-3
1	2	-3

x	$f(x)$
1	-2.5
0	-2
-1	-1

1pt



1pt

Range: $(-3,\infty)$ 1pt

Solve each equation using the one-to-one property for exponents. Show work! You may need to factor to solve.

16. $7^x = 7^3$

$x = 3$

17. $\left(\frac{1}{4}\right)^x = \frac{1}{64}$

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

$-1x = 3$

$x = +3$

18. $3^{-x} = 81$

$3^{-x} = 3^4$

$-x = 4$

$x = -4$

19. $4^{x^2} = 2^x$

$2^{2x^2} = 2^x$

$2x^2 = x$

$2x^2 - x = 0$

$x(2x-1) = 0$

$x = 0 \quad 2x-1=0$

$2x = 1$

$x = 1/2$

20. $9^{-x+15} = 27^x$

$3^{2(-x+15)} = 3^{3x}$

$2(-x+15) = 3x$

$-2x+30 = 3x$

$30 = 5x$

$6 = x$

21. $4^x \cdot 2^{x^2} = 16^2$

$2^{2x} \cdot 2^{x^2} = 2^{4 \cdot 2}$

$2^{2x+x^2} = 2^8$

$2x + x^2 = 8$

$x^2 + 2x - 8 = 0$

$(x+4)(x-2) = 0$

$x = -4 \quad x = 2$

Review Exercises

Find the domain of the given functions. Write answers in interval notation. Show work!

22. $f(x) = x^2 + 2$

no restrictions

so domain is all real #'s

$(-\infty, \infty)$

23. $f(x) = \sqrt{-2x+7}$ ← can't be negative under √

$-2x + 7 \geq 0$

$\frac{-2x}{-2} \geq \frac{-7}{-2}$

$x \leq 7/2$

$(-\infty, 7/2]$