4.2 WS 3

KEY

Evaluate the exponential function for the given x values.

1. $f(x)=4^x$ a. $x=-5$ $\frac{1}{1024}$ b. $x=3$ 64

2. $g(x)=11^x$ a. $x=2$ 121 b. $x=-3$ $\frac{1}{1331}$

3. $f(x)=\left(\frac{1}{5}\right)^x$ a. $x=-3$ 125 b. $x=4$ $\frac{1}{625}$

4. $g(x)=\left(\frac{3}{4}\right)^x$ a. $x=-2$ $\frac{16}{9}$ b. $x=4$ $\frac{81}{256}$

Use a calculator to evaluate the exponential function for the given x value. Round to the nearest hundredth.

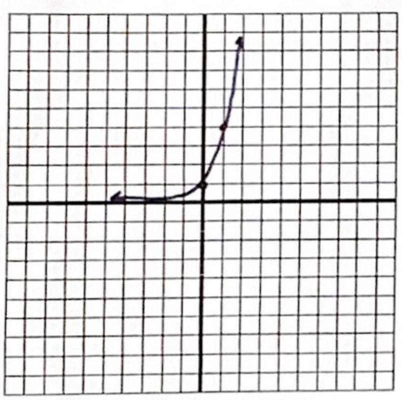
5. $f(x)=4^x$; $x=3.7$ 168.90

6. $h(x)=e^x$; $x=\sqrt{8}$ 16.92

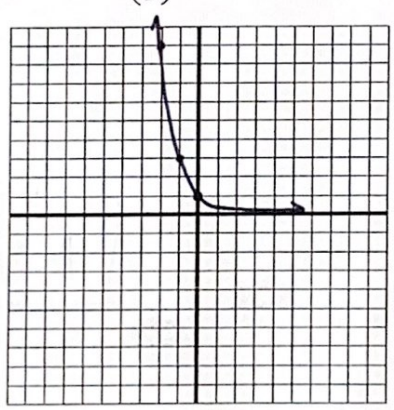
7. $g(x)=8.6^x$; $x=-4$ $.0002$

Sketch the graph of each function.

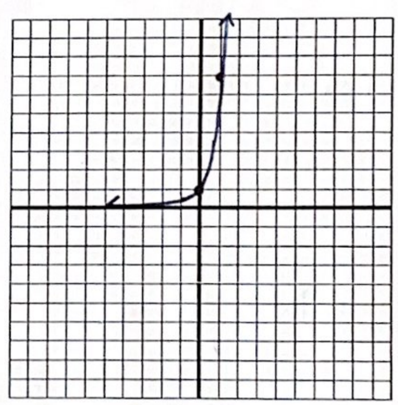
8. $f(x)=4^x$



9. $g(x)=\left(\frac{1}{3}\right)^x$



10. $h(x)=7^x$



Explain how to use the graph of the first function f to produce the graph of the second function F.

11. $f(x)=2^x; F(x)=2^x-6$ Shift down 6

12. $f(x)=4^x; F(x)=4^{x-4}-2$ Shift right 4 and down 2

13. $f(x)=(3)^x; F(x)=2(3)^x$ Vertical stretch away from the x-axis by a factor of 2.

14. $f(x)=\left(\frac{1}{3}\right)^x; F(x)=\left(\frac{1}{3}\right)^{x+5}+3$ Shift left 5, up 3

15. Lead shielding is used to contain radiation. The percentage of certain radiation that can penetrate x millimeters of lead shielding is given by $I(x) = 100e^{-1.5x}$.

a. What percentage of radiation, to the nearest tenth of a percent, will penetrate a lead shield that is 1 millimeter thick?

22.3%

b. How many millimeters of lead shielding are required so that less than 0.05% of the radiation penetrates the shielding? Round to the nearest millimeter.

5 mm

16. The number of bass in a lake is given by $P(t) = \dfrac{3600}{1+7e^{-0.05t}}$ where t is the number of months that have passed since the lake was stocked with bass.

a. How many bass were in the lake immediately after it was stocked? 450 bass
$t=0$

b. How many bass were in the lake 1 year after the lake was stocked? Round to the nearest bass. 744 bass
$t=12$

c. What will happen to the bass population as t increases without bound? It would approach 3600 bass.

Use the composition of functions to determine whether f and g are inverses of one another.

17. $f(x) = \frac{1}{2}x - \frac{1}{2}$; $g(x) = -2x+1$

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

$= -x + \frac{1}{2} - \frac{1}{2}$

$= -x$

$\boxed{\text{No}}$

18. $f(x) = \dfrac{2x}{x-3}$; $g(x) = \dfrac{x}{x-2}$

$\boxed{\text{No}}$

Find the inverse of each function, then state the domain and range of $f^{-1}(x)$.

19. $f(x) = \sqrt{3x-6}$

$3x-6 \geq 0$

$3x \geq 6$

$x \geq 2$

$y^2 = 3x-6$

$y^2+6 = 3x$

$\frac{1}{3}y^2+2 = x$

$f^{-1}(x) = \frac{1}{3}x^2+2$

D_x of $f^{-1}(x)$: $[0,\infty)$

R_y of $f^{-1}(x)$: $[2,\infty)$

20. $f(x) = \dfrac{x+2}{9-x}$

$9y - xy = x+2$

$9y-2 = x+xy$

$9y-2 = x(1+y)$

$\dfrac{9y-2}{1+y} = x$

$f^{-1}(x) = \dfrac{9x-2}{1+x}$

D_x of $f^{-1}(x)$: $(-\infty,-1)\cup(-1,\infty)$; R_y of $f^{-1}(x)$: $(-\infty,9)\cup(9,\infty)$

21. $f(x) = \sqrt[3]{x-5}$

$y^3 = x-5$

$f^{-1}(x) = x^3+5$

D_x of $f^{-1}(x) = (-\infty,\infty)$

R_y of $f^{-1}(x) = (-\infty,\infty)$