LESSON 169

1. $(2x^2)(5x^3) = 2 \cdot 5 \cdot x^{2+3} = 10x^5$

2. $\dfrac{(9x^{-4})(2x^3)}{6x} = \dfrac{9 \cdot 2}{6} x^{-4+3-1} = 3x^{-2} = \dfrac{3}{x^2}$

3. $(8x^2)(2x^{-3})^{-2} = (2^3x^2)(2^{-2}x^6) = 2x^8$

$ak = 2(8) = 16$

4. $\left(\dfrac{x^3y^2}{x^2y^4}\right)^5 = \dfrac{(x^3y^2)^5}{(x^2y^4)^5} = \dfrac{x^{15}y^{10}}{x^{10}y^{20}} = x^5y^{-10}$

$m - n = 5 - (-10) = 15$

5. $e \cdot e^{-1} \cdot e^{x-2} = e^{1-1+x-2} = e^{x-2}$

6. $(6e^{-3x})^2 = 6^2e^{-6x} = 36e^{-6x}$

$a/k = 36/(-6) = -6$

7. $7^{5-2x} = 7^{-x}$

$5 - 2x = -x$	One-to-one property
$x = 5$	Solve for x.

8. $2^{2x-5} = 8$

$2^{2x-5} = 2^3$	Rewrite using base 2.
$2x - 5 = 3$	One-to-one property
$x = 4$	Solve for x.

$2^x = 2^4 = 16$

9. $100^{2x-7} = \left(\dfrac{1}{1000}\right)^x$

$(10^2)^{2x-7} = (10^{-3})^x$	Rewrite using base 10.
$10^{2(2x-7)} = 10^{-3x}$	Exponent rules
$2(2x-7) = -3x$	One-to-one property
$x = 2$	Solve for x.

10. The answer is D.

$3^x \cdot (3^2)^y = (3^3)^z$	Rewrite using base 3.
$3^{x+2y} = 3^{3z}$	Exponent rules
$x + 2y = 3z$	One-to-one property

11. The answer is A.

12. The answer is D.

The graph involves a reflection of $y = 2^x$ over the x-axis, so eliminate A and B.

$(0, 2)$ is on the graph, so choose D.

13. $f(x)$ is $y = 4^x$ shifted up 1 unit.

The range of $y = 4^x$ is $(0, \infty)$,
so the range of $f(x)$ is $(1, \infty)$.

14. $f(x)$ is $y = 3^x$ shifted right 1 unit and down 4 units.

The asymptote of the graph of $y = 3^x$ is $y = 0$.
so the asymptote of the graph of $f(x)$ is $y = -4$.

15. $f(x) = ab^x$

$5 = ab^0$	Plug in $(0, 5)$.
$a = 5$	Zero exponent rule ($b^0 = 1$)

$f(x) = ab^x$

$10 = 5b^1$	Plug in a and $(1, 10)$.
$b = 2$	Solve for b.
$f(x) = 5(2)^x$	Write the function.

16. $f(x) = ab^x$

$18 = ab^{-1}$	Plug in $(-1, 18)$. Call it eq1.
$2 = ab^1$	Plug in $(1, 2)$. Call it eq2.
$a = 18b$	Solve eq1 for a.
$2 = (18b)b^1$	Plug a into eq2.
$2 = 18b^2$	Solve for b.
$b^2 = 1/9$	
$b = 1/3$	
$a = 18b = 6$	Use b to find a.
$f(x) = 6\left(\dfrac{1}{3}\right)^x$	Write the function.

17.

$y = e^x$	Parent function
$y = -e^x$	Reflect over the x-axis.
$y = -e^{x+2}$	Shift left 2 units.
$f(x) = -e^{x+2} - 3$	Shift down 3 units.

18. The purchase value of the car is $\$22{,}000$.

19. a = initial balance $= 40000$

$b = 100\% + 4\% = 104\% = 1.04$ because
new balance = previous + 4% of previous

The function is $y = 4000(1.04)^t$.

20. a = initial population $= 80000$

$b = 100\% - 5\% = 95\% = 0.95$ because
new population = previous – 5% of previous

The function $y = 80000(0.95)^t$ models the population of the town after t years.

When $t = 10$, $y = 47898.95513\ldots$.

The population will be about $48{,}000$.

21. a = initial number of bacteria $= 10$

b = growth factor $= 2$

$t/2$ = exponent because the y-value doubles
(is multiplied by 2) at $t = 2, 4, 6, \ldots$.

The function $y = 10(2)^{t/2}$ models the number of bacteria after t hours.

When $t = 8$, $y = 160$. There will be 160 bacteria.

22.

$25^x - 5^{x+2} = (5^2)^x - 5^{x+2}$	Rewrite using base 5.
$= (5^x)^2 - 5^x \cdot 5^2$	Exponent rules
$= y^2 - 25y$	Substitute.