For # 1 – 8, factor out the common term with the lesser power and write in factored form. Write your answers with positive exponents only.

1. $x^{-7}-x^{-9}$
2. $x^{-1}+x^{4}$
3. $x^{7/3}-x^{5/3}+x$
4. $x^{-2/5}+x^{-4/5}$
5. $3(x-1)^2+4(x-1)^3$
6. $3x(x+3)^4-(x+3)^3$
7. $2(2x-1)^{-2}+3(2x-1)^{-3}$
8. $4x^2(3-x)^{2/3}-2x(3-x)^{1/3}$
9. Write a formula for an exponential function with initial value of 2,200 and a growth factor of 1.5.
10. Write a formula for an exponential function with initial value of 10,000 and doubling every time period.
11. Identify each of the following as a growth or decay exponential function. Identify the growth or decay factor, the growth or decay rate, and the initial value.

    a) $A(n)=1{,}000(0.25)^n$

    b) $A(n)=100(1.01)^n$

    c) $A(n)=1.01(100)^{-n}$

    d) $A(n)=25\left(\frac{1}{3}\right)^n$

12. Write a formula for an exponential function with initial value of 2,200 and a decay factor of 0.25.
13. Suppose we were considering the population of a certain community. Suppose also that 250,000 people lived there in 2000 and that 5% of the population leave every year. How many people would be living there in 2010?
14. The official estimates of the remaining world oil reserves are 1,000 billion barrels of oil. The estimated rate of depletion is 3% per year. How much oil will be left in 50 years assuming the current rate of depletion?
15. Find $\ln(e^2)$
16. Find $\ln\left(\frac{1}{e^3}\right)$
17. Write as a logarithmic equation: $e^{2x+3}=12$
18. Find $\ln(e^{4x-1})$
19. Find the domain of $y=\log_5(2x+3)$
20. Find the domain of $y=\ln(3-2x)$

ANSWERS:

1. $\frac{1}{x^9}(x^2-1)$
2. $\frac{1}{x}(1+x^5)$
3. $x\left(x^{4/3}-x^{2/3}+1\right)$
4. $\frac{1}{x^{4/5}}\left(x^{2/5}+1\right)$
5. $(x-1)^2(4x-1)$
6. $(x+3)^3(3x^2+9x-1)$
7. $(2x-1)^{-3}(4x+1)$
8. $2x(3-x)^{1/3}\left[2x(3-x)^{1/3}-1\right]$
9. $A(t)=2{,}200(1.5)^t$
10. $A(t)=10{,}000(2)^t$
11. The general exponential function is of the form $A(n)=Ca^n$, with C as the initial value and a as the growth or decay factor.

    a) The function represents decay since the decay factor $a=0.25$ and the decay rate is $1-a=1-0.25=75\%$. The initial value is $C=1{,}000$

    b) The function represents growth since the growth factor $a=1.01$ and the growth rate is $a-1=1.01-1=1\%$. The initial value is $C=100$

    c) Since $A(n)=1.01(100)^{-n}=1.01\left(\frac{1}{100}\right)^n$, the function represents decay with decay factor $a=0.01$ and decay rate $1-a=1-0.01=99\%$. The initial value is $C=1.01$

    d) The function represents decay since the decay factor $a=\frac{1}{3}$ and the decay rate is $1-a=1-\frac{1}{3}=\frac{2}{3}$. The initial value is $C=25$

12. $A(n)=2{,}200(0.25)^n$
13. $A(n)=25{,}000(0.95)^n$

    For 2010, $n=10$ and $A(10)=25{,}000(0.95)^{10}\approx 14{,}968$

14. $A(50)=10^{12}(0.97)^{50}=218{,}065{,}375{,}347$
15. 2
16. -3
17. $\ln(12)=2x+3$
18. $4x-1$
19. $\left(-\frac{3}{2},\infty\right)$
20. $\left(-\infty,\frac{3}{2}\right)$