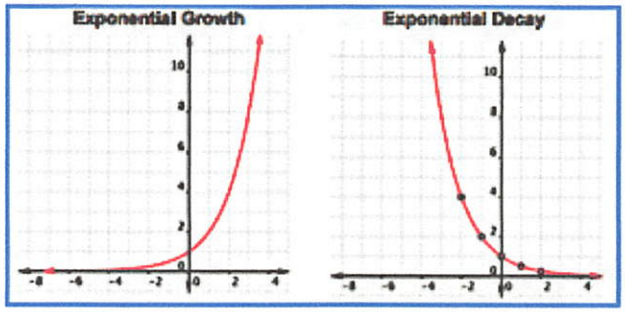
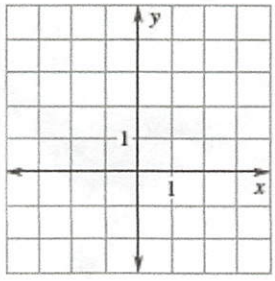
Notes 5.1 Exponential Functions

- Determine if an Exponential Function is a Growth or Decay
- Graph Exponential Functions (Growth and Decay)
- Graph Natural Exponential Functions (Growth and Decay)
- Graph Exponential Functions Using Transformations
- Applications of Exponential Functions

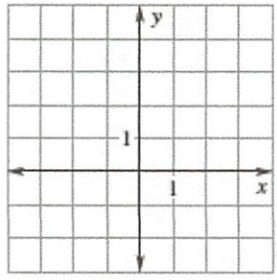


Sketch a graph of the equation. State the Domain and Range

$g(x) = 3^{x-1}$

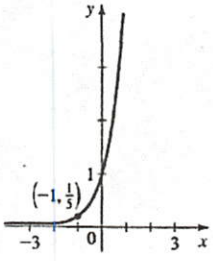


$g(x) = \frac{1^x}{4} + 2$

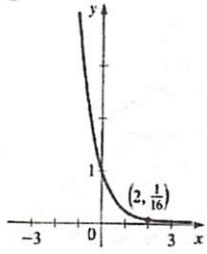


9–12 ■ Find the exponential function $f(x) = a^x$ whose graph is given.

10.



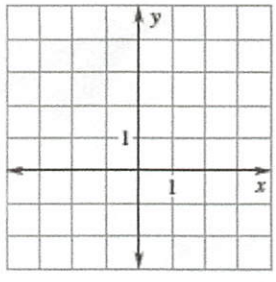
11.



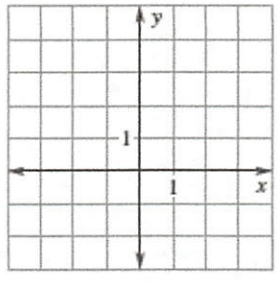
The natural base *e* As n approaches $+\infty$, $\left(1+\frac{1}{n}\right)^n \approx 2.718281828...$

Sketch a graph of the equation:

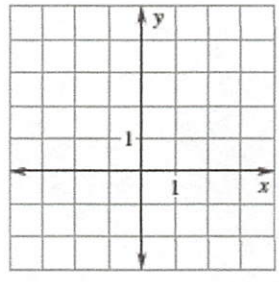
$g(x) = e^x$



$g(x) = e^{3x}$



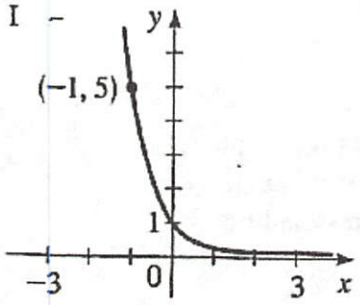
$g(x) = e^{-2x}$



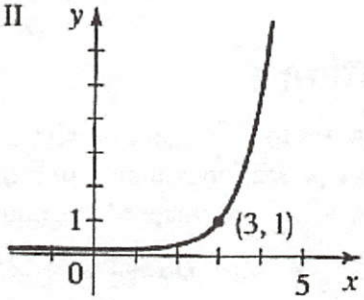
13–18 ■ Match the exponential function with one of the graphs labeled I–VI.

13. $f(x) = 5^x$
14. $f(x) = -5^x$
15. $f(x) = 5^{-x}$
16. $f(x) = 5^x + 3$
17. $f(x) = 5^{x-3}$
18. $f(x) = 5^{x+1} - 4$

I



II



Compound Interest:

69. If $3,000 is invested at an interest rate of 9% per year. Find the amount of the investment at the end of five years for the following compounded methods.

a. Annual c. Monthly e. Daily

Continuously Compounded Interest:

You deposit $4800 in an acount that pays 6.5% annual interest compounded continuously. What is the balance after 3 years?

61. A sky diver jumps from a reasonable height above the ground. The air resistance she experiences is proportional to her velocity, and the constant of proportionality is 0.2. It can be shown by the downward velocity of the sky diver at time t is given by:

$$v(t) = 80(1 - e^{-0.2t})$$

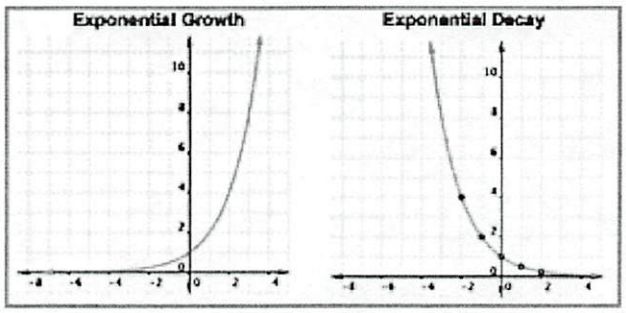
Where t is measured in seconds and $v(t)$ is measured in feet per second ft/sec

(a) Find the initial velocity of the sky diver.
(b) Find the initial velocity after 5 s. and after 10 s.
(c) Draw a graph of the velocity function $v(t)$
(d) The maximum velocity of a falling object with wind resistance is called its *terminal velocity*. From the graph in part (c) find the terminal velocity of this sky diver

Notes 5.1 Exponential Functions

- Determine if an Exponential Function is a Growth or Decay
- Graph Exponential Functions (Growth and Decay)
- Graph Natural Exponential Functions (Growth and Decay)
- Graph Exponential Functions Using Transformations
- Applications of Exponential Functions

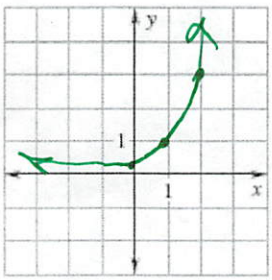
anchor point (0,1)
D: $\mathbb{R}$ R: $(0,\infty)$
asymptote $y=0$



anchor point (0,1)
D: $\mathbb{R}$ R: $(0,\infty)$
asymptote $y=0$

Sketch a graph of the equation. State the Domain and Range

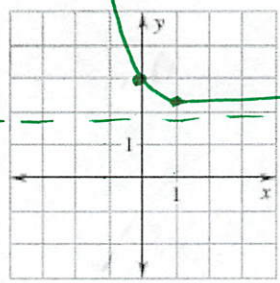
$g(x) = 3^{x-1}$ $(0,1) \Rightarrow (1,1)$



x	y
1	1
2	3
0	1/3

D: $\mathbb{R}$
R: $(0,\infty)$

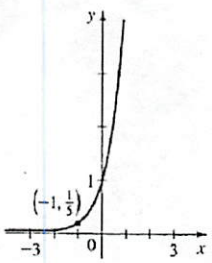
$g(x) = \left(\frac{1}{4}\right)^x + 2$ $q=2$



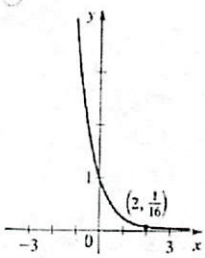
x	y
0	3
-1	6
1	2 1/4

9–12 ■ Find the exponential function $f(x) = a^x$ whose graph is given.

10.



11.



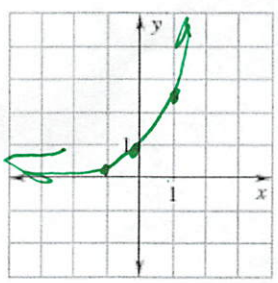
$(-1, 1/5)$ $(0,1)$
$y = a^x$
$\frac{1}{5} = a^{-1}$ $a = 5$
$y = 5^x$

$(2, 1/16)$ $(0,1)$
$y = a^x$
$1/16 = a^2$
$a = \frac{1}{4}$
$y = \left(\frac{1}{4}\right)^x$

The natural base *e* As n approaches $+\infty$, $\left(1+\frac{1}{n}\right)^n \approx 2.718281828...$

Sketch a graph of the equation:

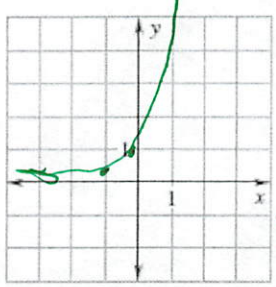
$g(x) = e^x$



x	y
0	1
1	2.7
-1	1/2.7

D: $\mathbb{R}$
R: $(0,\infty)$

$g(x) = e^{3x}$

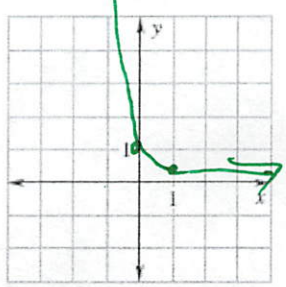


x	y
-1	1/9
0	1
1	20

D: $\mathbb{R}$
R: $(0,\infty)$

Growth

$g(x) = e^{-2x}$



x	y
-1	8
0	1
1	1/8

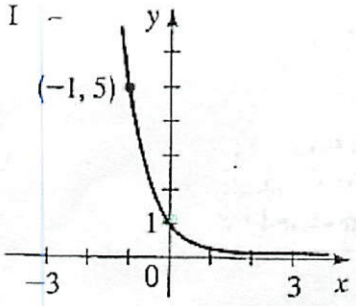
Decay

13–18 ■ Match the exponential function with one of the graphs labeled I–VI.

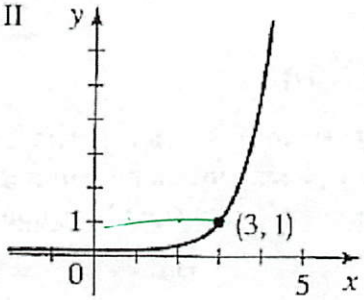
13. $f(x) = 5^x$
14. $f(x) = -5^x$
15. $f(x) = 5^{-x}$ I
16. $f(x) = 5^x + 3$
17. $f(x) = 5^{x-3}$ II
18. $f(x) = 5^{x+1} - 4$

$5^1 = 5$

I



II



→ 3

Compound Interest: $A = P\left(1 + \frac{r}{n}\right)^{nt}$ P: principal r: rate t: time n: times compounded

69. If \$3,000 is invested at an interest rate of 9% per year. Find the amount of the investment at the end of five years for the following compounded methods.

a. Annual $3{,}000\left(1 + \frac{.09}{1}\right)^{1(5)}$ 4615.87

c. Monthly $3{,}000\left(1 + \frac{.09}{12}\right)^{12(5)}$ 4697.04

e. Daily $3{,}000\left(1 + \frac{.09}{365}\right)^{365(5)}$ 4704.68

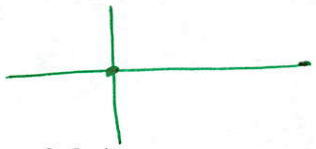
Continuously Compounded Interest: $A = Pe^{rt}$

You deposit \$4800 in an acount that pays 6.5% annual interest compounded continuously. What is the balance after 3 years?

$4800\, e^{.065(3)} = 5833.49$

61. A sky diver jumps from a reasonable height above the ground. The air resistance she experiences is proportional to her velocity, and the constant of proportionality is 0.2. It can be shown by the downward velocity of the sky diver at time t is given by:

$$v(t) = 80(1 - e^{-0.2t})$$



Where t is measured in seconds and $v(t)$ is measured in feet per second ft/sec

(a) Find the initial velocity of the sky diver. $80(1 - e^{-.2(0)}) = 0$

(b) Find the initial velocity after 5 s. and after 10 s. $80(1 - e^{-.2(5)}) = 50.6$; 69

(c) Draw a graph of the velocity function $v(t)$

(d) The maximum velocity of a falling object with wind resistance is called its *terminal velocity*. From the graph in part (c) find the terminal velocity of this sky diver 80