

**LESSON**  
**13-2**

# Exponential Decay Functions

## Reteach

$f(x) = b^x, 0 < b < 1$

Horizontal Asymptote

$y = 0 \longrightarrow y = k$

Reference Point

$(0, 1) \longrightarrow (h, a + k)$

Reference Point

$\left(-1, \frac{1}{b}\right) \longrightarrow \left(h-1, \frac{a}{b} + k\right)$

$g(x) = ab^{x-h} + k$

**Example** State the parent function, decay factor, asymptote, and reference points for the given function.

$$g(x) = 3\left(\frac{1}{5}\right)^{x-2} + 4$$

Parent function	Decay factor	Asymptote	Reference points
$f(x) = \left(\frac{1}{5}\right)^x$	$b = \frac{1}{5}$	$y = 4$	$(h, a + k) = (2, 3 + 4) = (2, 7)$ $\left(h-1, \frac{a}{b} + k\right) = \left(2-1, \frac{3}{\frac{1}{5}} + 4\right) = (1, 19)$

**State the parent function, decay factor, asymptote, and reference points for the given function.**

1.  $g(x) = 4\left(\frac{1}{2}\right)^{x-3} - 2$

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2.  $g(x) = 7\left(\frac{1}{10}\right)^{x+2} + 1$

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3.  $g(x) = 6(0.3)^{x+3} - 3$

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4.  $g(x) = -\left(\frac{1}{4}\right)^{x-6} - 5$

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5.  $g(x) = \left(\frac{2}{3}\right)^x + 9$

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6.  $g(x) = -2\left(\frac{3}{10}\right)^{x-4} + 7$

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### Reteach 13-2

- $f(x) = \left(\frac{1}{2}\right)^x$ ;  $b = \frac{1}{2}$ ;  $y = -2$ ; (3, 2), (2, 6)
- $f(x) = \left(\frac{1}{10}\right)^x$ ;  $b = \frac{1}{10}$ ;  $y = 1$ ; (-2, 8), (-3, 71)
- $f(x) = 0.3^x$ ;  $b = 0.3$ ;  $y = -3$ ; (-3, 3), (-4, 17)
- $f(x) = \left(\frac{1}{4}\right)^x$ ;  $b = \frac{1}{4}$ ;  $y = -5$ ; (6, -6), (5, -9)
- $f(x) = \left(\frac{2}{3}\right)^x$ ;  $b = \frac{2}{3}$ ;  $y = 9$ ; (0, 10), (-1, 10.5)
- $f(x) = \left(\frac{3}{10}\right)^x$ ;  $b = \frac{3}{10}$ ;  $y = 7$ ; (4, 5),  $\left(3, \frac{1}{3}\right)$

### Reteach 13-3

- $g(x) = -2e^{x+1} - 3$
- $g(x) = 3e^{x-9} + 4$
- $g(x) = 0.5e^{x-2} - 0.1$
- $g(x) = -e^{x+3} + 2$

### Reteach 13-4

- About 18.8 years
- About 11.6 years

### Reteach 14-1

- $y = 1.2 \cdot 1.3^x$
- $y = 56 \cdot 0.9^x$
- $y = -20 \cdot 1.1^x$
- $y = 3.0 \cdot 2.1^x$
- $y = 100 \cdot 0.8^x$
- $y = -5 \cdot 0.5^x$

### Reteach 14-2

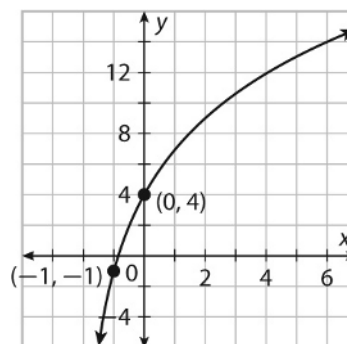
- $f(x) = 0.598 \cdot 2.402^x$
- $f(x) = 2.156x + 13.642$
- $f(x) = 0.526x^2 - 7.803x + 81.341$
- $f(x) = 203.67 \cdot 0.95^x$

### Reteach 15-1

- $\log_2 64 = 6$
- $\log_4 \frac{1}{16} = -2$
- $\log_{\frac{1}{3}} \frac{1}{27} = 3$
- $7^2 = 49$
- $2^{-4} = \frac{1}{16}$
- $8^x = 48$
- 4
- $\frac{1}{3}$
- 2

### Reteach 15-2

- $x = -2$ ; (-1, -1), (0, 4);



- $x = -5$ ; (-4, 2), (5, 1);

