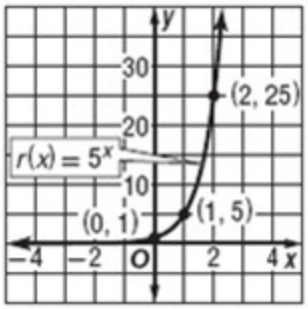
3-1 Exponential Functions

Sketch and analyze the graph of each function. Describe its domain, range, intercepts, asymptotes, end behavior, and where the function is increasing or decreasing.

2. $r(x) = 5^x$

ANSWER:

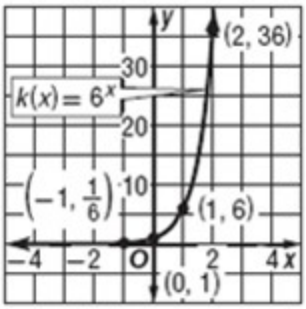
D = $(-\infty, \infty)$; R = $(0, \infty)$; y-intercept: 1; asymptote: x-axis; $\lim_{x \to -\infty} r(x) = 0, \lim_{x \to \infty} r(x) = \infty$; increasing on $(-\infty, \infty)$



4. $k(x) = 6^x$

ANSWER:

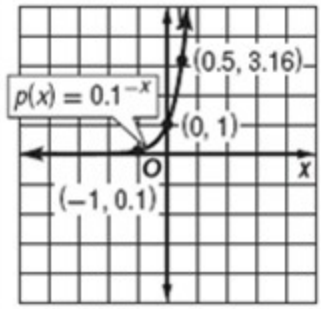
D = $(-\infty, \infty)$; R = $(0, \infty)$; y-intercept: 1; asymptote: x-axis; $\lim_{x \to -\infty} k(x) = 0, \lim_{x \to \infty} k(x) = \infty$; increasing on $(-\infty, \infty)$



6. $p(x) = 0.1^{-x}$

ANSWER:

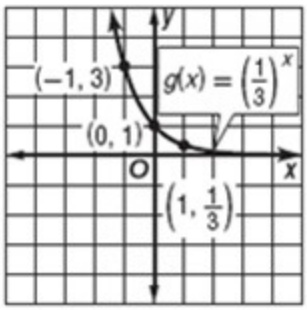
D = $(-\infty, \infty)$; R = $(0, \infty)$; y-intercept: 1; asymptote: x-axis; $\lim_{x \to -\infty} p(x) = 0, \lim_{x \to \infty} p(x) = \infty$; increasing for $(-\infty, \infty)$



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

ANSWER:

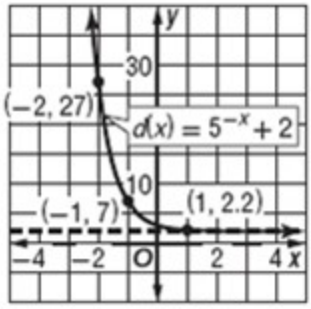
D = $(-\infty, \infty)$; R = (0, ∞); y-intercept: 1; asymptote: x-axis; $\lim_{x \to -\infty} g(x) = \infty, \lim_{x \to \infty} g(x) = 0;$ decreasing on $(-\infty, \infty)$



10. $d(x) = 5^{-x} + 2$

ANSWER:

D = $(-\infty, \infty)$; R = (2, ∞); y-intercept: 3; asymptote: y = 2; $\lim_{x \to -\infty} d(x) = \infty, \lim_{x \to \infty} d(x) = 2;$ decreasing for $(-\infty, \infty)$

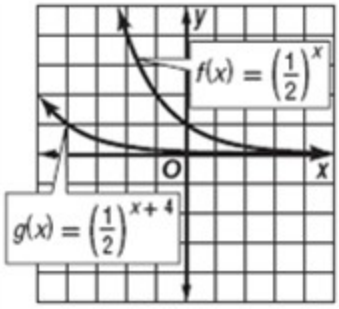


Use the graph of $f(x)$ to describe the transformation that results in the graph of $g(x)$. Then sketch the graphs of $f(x)$ and $g(x)$.

12. $f(x) = \left(\frac{1}{2}\right)^x; g(x) = \left(\frac{1}{2}\right)^{x+4}$

ANSWER:

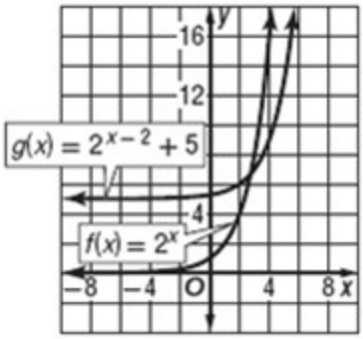
$g(x)$ is the graph of $f(x)$ translated 4 units to the left.



14. $f(x) = 2^x$; $g(x) = 2^{x-2} + 5$

ANSWER:

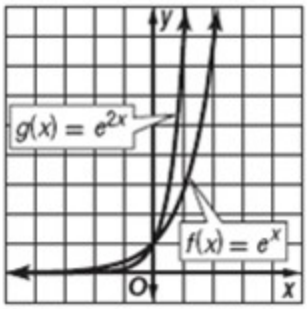
$g(x)$ is the graph of $f(x)$ translated 2 units to the right and 5 units up.



16. $f(x) = e^x$; $g(x) = e^{2x}$

ANSWER:

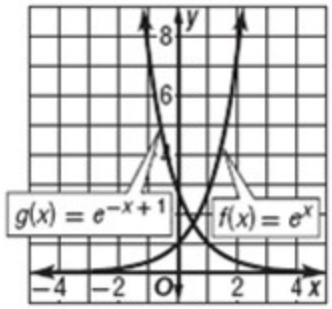
$g(x)$ is the graph of $f(x)$ compressed horizontally by a factor of 2.



18. $f(x) = e^x$; $g(x) = e^{-x+1}$

ANSWER:

$g(x)$ is the graph of $f(x)$ reflected in the y-axis and translated 1 unit to the right.



20. $f(x) = e^x$; $g(x) = -(e^x) + 4$

ANSWER:

$g(x)$ is the graph of $f(x)$ reflected in the x-axis and translated 4 units up.