



## SECTION 5.6: EXPONENTIAL FUNCTIONS

- Exponential Function
- Exponential Growth and Exponential Decay
- Common Base Property of Exponents: For  $b \neq 1$ ,  $b^S = b^T$  if and only if  $S = T$ .
- Finance Applications

Pr 1. Let  $f(x) = \begin{cases} 3x - 1 & x < -3 \\ x^2 - 1 & -3 \leq x < 3 \\ 7 & 3 \leq x \leq 5 \\ \frac{1}{x-5} & x > 6 \end{cases}$ . Compute the following function values.

(a)  $f(-5)$ .

(b)  $f(-3)$ .

(c)  $f(0)$ .

(d)  $f(3)$ .

(e)  $f(6)$ .

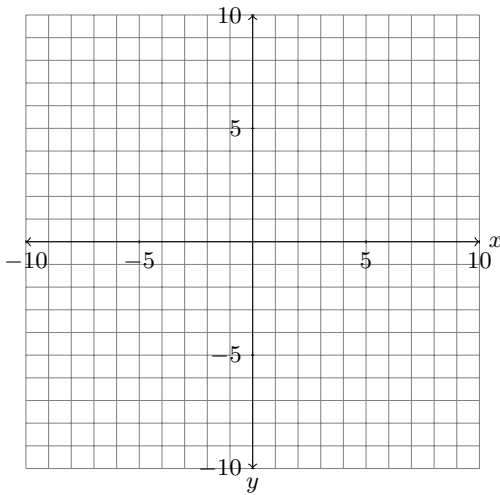
(f)  $f(7)$ .

**Pr 2.** State the domain of  $g(x)$ .

$$g(x) = \begin{cases} x + 1 & x < -3 \\ \frac{1}{x+1} & -2 \leq x < 3 \\ \sqrt{x-2} & x \geq 3 \end{cases}$$

**Pr 3.** Sketch the graph of  $h(x)$ .

$$h(x) = \begin{cases} 2x - 3 & x \leq -3 \\ 8 & -1 \leq x < 2 \\ x^2 - 3 & x \geq 2 \end{cases}$$



**Pr 4.** Rewrite  $f(x) = |5 - 3x|$  as a piecewise-defined function.

**Pr 5.** Suppose that on the island of St. Thomas, the cost of electricity is \$0.12 per kilowatt for the first 3000 kilowatts a household uses, per month. After 3000 kilowatts, the cost increases to \$0.20 per additional kilowatt used during the month. Write the function,  $C(e)$ , representing the cost,  $C$ , for  $e$  kilowatts of electricity used by a household in this country in a month.

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**Pr 1.** Rewrite each exponential expression as a single equivalent expression in the stated base.

(a)  $125 \cdot 5^{x+3}$ , base 5.

(b)  $\left(\frac{1}{2}\right)^x \frac{8}{4^x}$ , base 2.

**Pr 2.** Determine if each function is an exponential function. If the function is an exponential function, determine whether the function represents exponential growth or decay.

(a)  $7^{-x}$

(b)  $-3x^{17}$

(c)  $\frac{3}{4}2^{x/2+4}$

**Pr 3.** State the domain, range, end behavior,  $x$ -intercepts, and  $y$ -intercepts of each function.

(a)  $f(x) = \left(\frac{5}{3}\right)^{x+2}$

(b)  $g(x) = 5^{4-x}$

**Pr 4.** State the domain of each function. Write your answer using interval notation.

(a)  $f(x) = 5^{\frac{2x}{x-4}}$

(b)  $g(x) = e^{\sqrt{1-4x}}$

(c)  $h(a) = \frac{\sqrt[3]{2x-5}}{3^{x+2}}$

**Pr 5.** Algebraically solve each equation for  $x$ .

(a)  $\left(\frac{1}{4}\right)^{2x} = 8^{x-5}$ .

(b)  $2^{2x}(2^x + 8) = \frac{2^x + 2^{3x}}{2^x}$

(c)  $\left(\frac{1}{25}\right)^{3x} \cdot 5^{x^2} - 1 = 0$



**Pr 6.** If you invest \$2000 in an account that earns interest at a rate of 3.16% per year, compounded monthly, how much will be in the account after 10 years? If the annual interest is compounded continuously instead of monthly, how much more will be in the account after 10 years compared to your previous answer?

**Pr 7.** If a company opens in 2018, and the company's revenue grows at an annual rate of 125% per year, the revenue function would be  $R(t) = R_0\left(\frac{5}{4}\right)^t$ , where  $R_0$  represents the initial revenue earned in 2018, and  $t$  represents the number of years since 2018. How much money did the company bring in, in revenue, in 2017, if the company's revenue is \$850,000 in 2023?