

## Problem Set 7-6

### Do These Quickly

- Q1.** An exponential function has the —?— —?— property.
- Q2.** A power function has the —?— —?— property.
- Q3.** The equation  $y = 3 + 5 \ln x$  defines a —?— function.
- Q4.** The function in Q3 has the —?— —?— property.
- Q5.** The expression  $\ln x$  is a logarithm with the number —?— as its base.
- Q6.** Write in exponential form:  $h = \log_p m$
- Q7.** Write in logarithmic form:  $c = 5^j$
- Q8.** If an object rotates at 100 revolutions per minute, how many radians per minute is this?
- Q9.** Write the general equation for a quadratic function.
- Q10.**  $\cos \pi$  is  
A. -1   B. 0   C. 1   D.  $\frac{1}{2}$    E. Undefined

1. Given the exponential function  $f(x) = 1.2^x$  and the logistic function  $g(x) = \frac{1.2^x}{1.2^x + 1}$ ,

- Plot both graphs on the same screen. Use a domain of  $x \in [-10, 10]$ . Sketch the result.
- How do the two graphs compare for large positive values of  $x$ ? How do they compare for large negative values of  $x$ ?
- Find the approximate  $x$ -value of the point of inflection for function  $g$ . For what values of  $x$  is the graph of function  $g$  concave up? Concave down?
- Explain algebraically why the logistic function has a horizontal asymptote at  $y =$
- Transform the equation of the logistic function so that an exponential term appears only *once*. Show numerically that the resulting equation is equivalent to  $g(x)$  as given.

2. Figure 7-6d shows the logistic function

$$f(x) = \frac{3e^{0.2x}}{e^{0.2x} + 4}$$

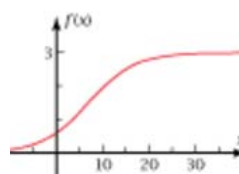


Figure 7-6d

- Explain algebraically why the graph has a horizontal asymptote at  $y = 3$ .
- Read the point of inflection from the graph. Find the  $x$ -coordinate algebraically.
- For what values of  $x$  is the graph concave up? Concave down?
- Transform the equation so that there is only *one* exponential term. Confirm by graphing that the resulting equation is equivalent to  $f(x)$  as given.

3. *Spreading the News Problem:* You arrive at school and meet your mathematics teacher, who tells you today's test has been cancelled! You and your friend spread the good news. The table shows the number of students,  $y$ , who have heard the news after  $x$  minutes have passed since you and your friend heard the news.

$x$ (min)	$y$ (students)
0	2
10	5
20	13
30	35
40	90

- Plot the points. Imagine a function fit to the points. Is the graph of this function concave up or concave down or both?
- There are 1220 students in the school. Use the numbers of students at 0 minutes and at 40 minutes to find the equation of the logistic function that meets these constraints.