Review of Exponents and Radicals: (see page 967-970 in the text)

	Rules and definitions (x,y real numbers; m,n integers)		examples	
1.	$x^0 = 1$	definition, for x≠0	$7^0 = 1$	$e^0 = 1$
2.	$x^{-n} = \frac{1}{x^n}$	definition of negative exponents, x≠0	$5^{-2} = \frac{1}{5^2}$	$e^{-3} = \frac{1}{e^3}$
3.	$x^m x^n = x^{m+n}$	product rule	$2^3 2^5 = 2^8$	$e^4 e^3 = e^7$
4.	$\left(x^m\right)^n = x^{mn}$	power of a power rule	$\left(3^2\right)^5 = 3^{10}$	$\left(e^3\right)^4 = e^{12}$
5.	$\frac{x^m}{x^n} = x^{m-n}$	quotient rule	$\frac{2^7}{2^2} = 2^5$	$\frac{e^6}{e^2} = e^4$
6.	$(xy)^n = x^n y^n$	power of a product rule	$3^2 3^5 = 3^7$	$e^3 e^4 = e^7$
7.	$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$	power of a quotient	$\left(\frac{2}{3}\right)^5 = \frac{2^5}{3^5}$	$\left(\frac{e}{3}\right)^2 = \frac{e^2}{3^2}$
8.	$x^{\frac{1}{n}} = \sqrt[n]{x}$	def., (n ≥ 2) and (x > 0 or n is odd)	$(32)^{\frac{1}{5}} = \sqrt[5]{32} = 2$	$e^{\frac{1}{3}} = \sqrt[3]{e}$
9.	$x^{\frac{m}{n}} = \sqrt[n]{x^m}$	def. - (n ≥ 2) and (x > 0 or n odd)	$(32)^{\frac{2}{5}} = \left(\sqrt[5]{32}\right)^2 = 2^2 = 4$	

Notice that if x = -1 and n = 2, then the expression $x^{\frac{1}{n}} = (-1)^{\frac{1}{2}} = \sqrt{-1}$ is <u>not defined</u> in the set of real numbers (since the square root of a negative number does not exist in the set of reals.)

However, if <u>b is a postive real number</u>, then the expression b^n can be defined for <u>any real number n</u>.

(See the discussion on page 294 of your text.   Try evaluating $2^{\sqrt{2}}$ or $2^{-\pi}$ on your calculator.)

When defining the exponential function, $f(x) = b^x$, the base b, is required to be positive so that f is defined for any real x, i.e., so the domain of f is (-∞,∞).