Section 4.2
Solutions and Hints

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for the book:

Precalculus, Mathematics for Calculus 4th Edition
by James Stewart, Lothar Redlin and Saleem Watson.

22. Evaluate the given expression.

22 a. $\log_4 (2^{1/2})$

$\log_4 \sqrt{2}$	$= \log_4(2^{1/2})$	since the base is 4
	$= \log_4((4^{1/2})^{1/2})$	getting everything in terms of 4
	$= \log_4(4^{1/4})$	is a good idea
	$= (1/4) * \log_4(4)$	
	$= (1/4) * 1$	because stuff will cancel nicely
	$=$ **1/4**	

22 b. $\log_4 (½)$

$$\log_4(½) = \log_4(2^{-1})$$
$$= \log_4((4^{1/2})^{-1})$$
$$= \log_4(4^{-1/2})$$
$$= -½ \log_4(4)$$
$$= -½ * 1$$
$$= \mathbf{-½}$$

22 c. $\log_4 (8)$

If you haven't seen the pattern, solve $8 = 4^k$ first and then substitute stuff in.
It goes like this:

$$8 = 4 * 2 = 4 * 4^{1/2} = 4^{3/2}$$

So

$$\log_4(8) = \log_4(4^{3/2}) = \mathbf{3/2}$$

30 a. Solve for x: $\log_x(6) = ½$

$\log_x(6) = ½$ → $x^{\log_x 6} = x^{1/2}$ — This works because if a = b then $x^a = x^b$

→ $6 = x^{1/2}$ — Now square both sides

→ **36 = x**

30 b. Solve for x: $\log_x(3) = 1/3$

$\log_x(3) = 1/3$ → $x^{\log_x 3} = x^{1/3}$

→ $3 = x^{1/3}$ — Now cube both sides

→ **27 = x**

60. Find the domain of $g(x) = \ln(x - x^2)$

Recall the domain of a function is the allowable x values of the function, g(x).
Recall that you can only take the log (or natural log) of non-negative numbers.
So solve $x - x^2 \geq 0$

$x - x^2 \geq 0$ → $x(1 - x) \geq 0$

Notice $x*(1 - x) = 0$ at x = 0 and x = 1. So use a sign table to solve:

	(-∞, 0)	0	(0, 1)	1	(1, ∞)
sign of x	-	0	+	+	+
sign of (1 – x)	+	+	+	0	-
sign of x * (1 – x)	-	0	+	+	-

So the domain is whatever intervals make x * (1 – x) non-negative.

Domain = [0, 1]