1) Find the domain of each of the following functions:

a) $f(x) = x + 5x^3$

$\mathbb{R}$

or $(-\infty, \infty)$

b) $f(x) = \sqrt{x+7}$

$x + 7 \geq 0$

$x \geq -7$

domain $[-7, \infty)$

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

$x - 4 \neq 0$

$x \neq 4$

domain $\mathbb{R} \setminus \{4\}$

or $(-\infty, 4) \cup (4, \infty)$

2) Solve the equation:
$|x + 3| = 5$

$x + 3 = 5$ or $x + 3 = -5$

$x = 2$ or $x = -8$

3) Solve the inequality, using the "Test point" method we learned in class and showing all work to justify your answer: leave numbers in the form of integers or fractions, not decimals. Give your answer as a graph, then in interval and inequality form.

$|3x - 1| \geq 7$

$|3x - 1| = 7$

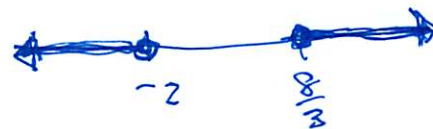$3x - 1 = 7$ or $3x - 1 = -7$

$3x = 8$ or $3x = -6$

$x = \frac{8}{3}$ or $x = -2$

Test points:

$x = -3$	$x = 0$	$x = 3$
$|3(-3)-1| \overset{?}{\geq} 7$	$|3(0)-1| \overset{?}{\geq} 7$	$|3(3)-1| \overset{?}{\geq} 7$
$|8| \geq 7$	$|-1| \not\geq 7$	$|9-1| = |8| \geq 7$
yes	no	yes

Solution

$(-\infty, -2] \cup [\frac{8}{3}, \infty)$

$x \leq -2$ or $x \geq \frac{8}{3}$

4) For the function $f(x) = \sqrt{x-3}$, find the value of each of the following. Simplify your answers as much as possible but do not use decimals.

a) $f(7) = \sqrt{7-3} = \sqrt{4} = 2$

b) $f(0) = \sqrt{0-3}$ is not real

undefined

c) $f(3) = \sqrt{3-3} = \sqrt{0} = 0$

d) $f(a+h)$

$= \sqrt{a+h-3}$

e) $f(a) = \sqrt{a-3}$

f) $f(a+h) - f(a)$

$= \sqrt{a+h-3} - \sqrt{a-3}$

g) $\frac{f(a+h)-f(a)}{h}$

$= \dfrac{\sqrt{a+h-3} - \sqrt{a-3}}{h}$

$= \dfrac{\left(\sqrt{a+h-3} - \sqrt{a-3}\right)\left(\sqrt{a+h-3} + \sqrt{a-3}\right)}{h\left(\sqrt{a+h-3} + \sqrt{a-3}\right)}$

$= \dfrac{(a+h-3) - (a-3)}{h\left(\sqrt{a+h-3} + \sqrt{a-3}\right)}$

$= \dfrac{h}{h\left(\sqrt{a+h-3} + \sqrt{a-3}\right)}$

$= \boxed{\dfrac{1}{\sqrt{a+h-3} + \sqrt{a-3}}}$

5) Give the formula for the function g(x) whose graph is the same as the graph of $f(x) = \sqrt{x}$ but shifted to the left by 4 units and up by 2 units.

$g(x) = \sqrt{x+4} + 2$