MAT 136 (Calculus I), Prof. Jim Swift
Worksheet 3, Domain, Linear and Exponential Functions

1. In this problem, you will give the default domain of several functions, following the pattern given for the first function, f: In the first blank put an inequality, or inequalities separated by "and". After writing down the inequalities find the set that satisfies them. Use interval notation, with $\cup$ for union if required, to describe the domain.

The domain of $f(x) = \sqrt{x-1}$ is all x such that $x - 1 \geq 0$.

The domain of f is $[1, \infty)$.

Sketch the domain:

(a) The domain of $g(x) = \dfrac{x-1}{x}$ is all x such that $x \neq 0$.

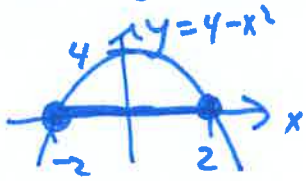
The domain of g is $(-\infty, 0) \cup (0, \infty)$.

Sketch the domain:

2 methods:
- $4 - x^2 = 0$ at both places
  $x^2 = 4$
  $x = \pm 2$
- A: check $x = -3, x = 0, x = 3$
- B: sketch $y = 4 - x^2$

(b) The domain of $h(x) = \sqrt{4 - x^2}$ is all x such that $4 - x^2 \geq 0$.

The domain of h is $[-2, 2]$.



Sketch the domain:

(c) The domain of $k(x) = \dfrac{1}{\ln(x)}$ is all x such that $\ln(x) \neq 0$ and $x > 0$.

$x \neq e^0$

$x \neq 1$

The domain of k is $(0, 1) \cup (1, \infty)$.

Sketch the domain:

2. A population of bacteria is 100 at the start of an experiment, and it is 300 after 1 hour. This problems asks for two models of this population $P = f(t)$, where t is measured in hours.

(a) Find a linear function of the form $P = mt + b$.

(b) Find an exponential function of the form $P = a \cdot b^t$.

(c) Sketch the two functions.

(a). $b = 100$ is given. $m = \dfrac{300 - 100}{1 - 0} = 200$

so $\boxed{P = 200t + 100}$

(b) $a = 100$ is given.

$b = \dfrac{300}{100} = 3$.

so $\boxed{P = 100 \cdot 3^t}$