February 3, 2017 Math 124b Name Key

1. (5 pts) Consider the function,

$$y = \sqrt{6 - x^2}$$

Find the domain of this function. Determine the x and y-intercepts. Sketch a graph of the function.

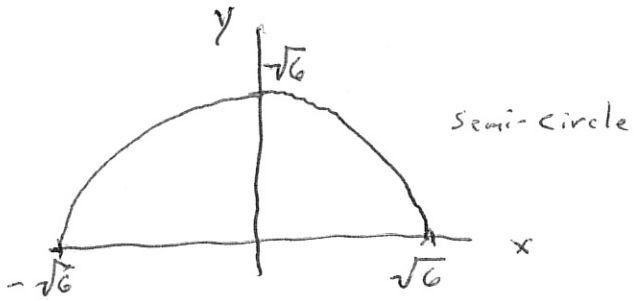
$-2.4495 \leq x \leq 2.4495$

Domain: $-\sqrt{6} \leq x \leq \sqrt{6}$

x-intercepts $\pm\sqrt{6}$

y-intercept $\sqrt{6}$

Sketch of Graph:



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2. (7 pts) Consider the function,

$$y = \frac{8 + 3x}{x - 4}$$

find the domain. Find all x and y-intercepts. Determine any horizontal or vertical asymptotes. (**If no asymptote exists, then write "NONE."**) Sketch the graph.

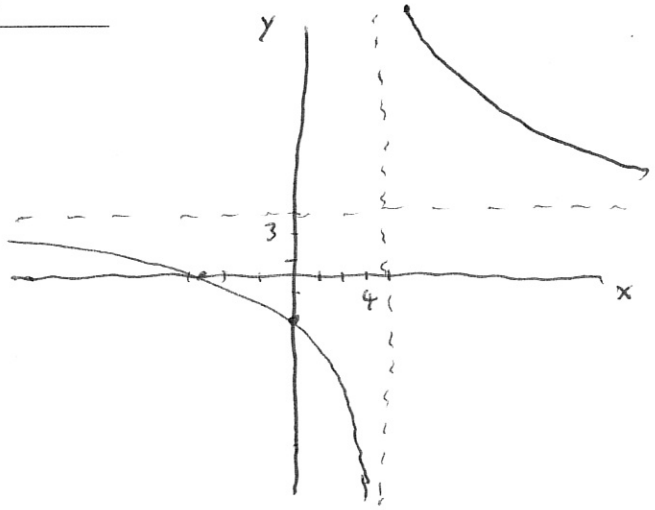
Domain: $x \neq 4$

x-intercept $-8/3$ and y-intercept -2

Vertical Asymptote: $x = 4$

Horizontal Asymptote: $y = 3$

GRAPH:



2. (8 pts) The Lambert-Beer law for absorbance of light by a spectrophotometer is a linear relationship, which can have the form,

$$A = mc,$$

where c is the concentration of the sample, A is absorbance, and m is the slope that must be determined from standards.

a. Below are data collected on samples from a collection of acid standards using an acid indicator.

c (mM)	1	2	5
A	1.7	3.2	8.3

Write all the square errors. Write a quadratic function $J(m)$ that measures the sum of squares error based on the standards above for the line fitting the data. Find the vertex of this quadratic function.

$e_1^2 =$ $(1.7-m)^2 = 2.89 - 3.4m + m^2$

$e_2^2 =$ $(3.2-2m)^2 = 10.24 - 12.8m + 4m^2$

$e_3^2 =$ $(8.3-5m)^2 = 68.89 - 83.0m + 25m^2$

$J(m) =$ 30 $m^2 +$ 99.2 $m +$ 82.02.

The vertex location $m_v =$ 1.6533

b. The vertex gives the value of the best slope m. Use this model (with the best value of m) to determine the concentration of an unknown sample with an absorbance of $A = 2.5$.

$c =$ 1.5121 $\qquad c = \frac{A}{m} = \frac{2.5}{1.6533}$