Math Analysis I Honors – Review Sec. 4.1 Quiz

1. Find the domain and zeros for the following functions.

a) $f(x) = x^3 + 3x^2 - 70x$

$x^3+3x^2-70x=0$
$x(x^2+3x-70)=0$
$x(x+10)(x-7)=0$
$x=0,-10,7$

Zeros
$(0,0)\ (-10,0)$
$(7,0)$

D: $(-\infty,\infty)$

b) $f(x) = \sqrt{9-x^2}$

$9-x^2 \geq 0$ — sign chart: $-$ | $+$ | $-$ at -3, 3 — D: $[-3,3]$

Zeros: $9-x^2=0$ $(3-x)(3+x)=0$ $x=\pm 3$ $(3,0)\ (-3,0)$

* Need graph or sign analysis b/c bigger than a linear term.

c) $f(x) = \frac{4x-1}{5-x^2}$

D: $5-x^2 \neq 0$
$5 \neq x^2$ $x \neq \pm\sqrt{5}$
D: $(-\infty,-\sqrt{5}) \cup (-\sqrt{5},\sqrt{5}) \cup (\sqrt{5},\infty)$

Zeros: Numerator $= 0$
$4x-1=0$
$x=1/4$
$(1/4,0)$

d) $f(x) = \sqrt{x+7} - 12$

D: $\sqrt{x+7} \geq 0$
$x+7 \geq 0$
$x \geq -7$
$[-7,\infty)$

Zeros
$\sqrt{x+7}-12=0$
$(\sqrt{x+7})^2=(12)^2$
$x+7=144$
$-7\ \ -7$
$x=137$
$(137,0)$

e) $f(x) = 2x^2 + 11x - 6$

D: $(-\infty,\infty)$

Zeros: $2x^2+11x-6=0$
$(2x-1)(x+6)=0$
$x=1/2$ $x=-6$
$(1/2,0)(-6,0)$

f) $f(x) = \frac{\sqrt{8-x}}{x+5}$

D: $(-\infty,-5) \cup (-5,8]$

$x+5 \neq 0$
$x \neq -5$ AND $\sqrt{8-x} \geq 0$
$8-x \geq 0$
$x \leq 8$

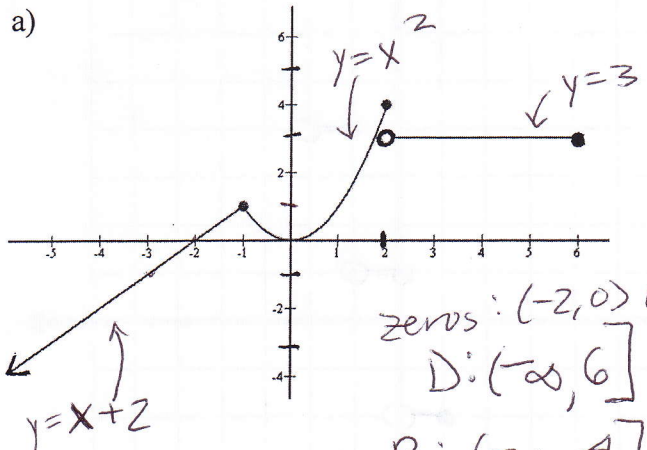
Zeros: Num $= 0$
$\sqrt{8-x}=0$
$x=8$
$(8,0)$

g) $f(x) = |x-4|$

D: $(-\infty,\infty)$ Zeros $|x-4|=0$ $x=4$ $(4,0)$

2. Find the equation of the following piecewise functions. Also find the domain, range, and zeros.

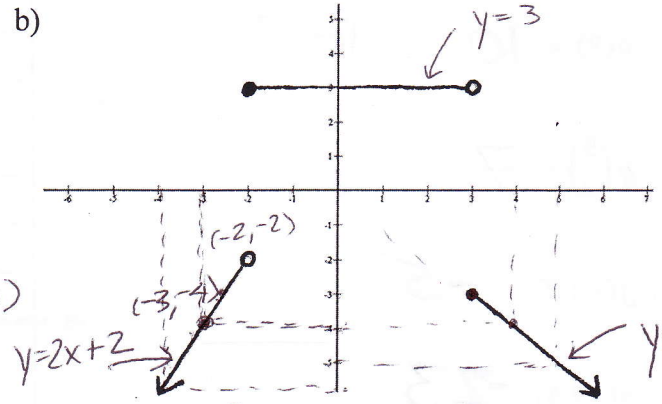
a)



zeros: $(-2,0)\ (0,0)$
D: $(-\infty,6]$
R: $(-\infty,4]$

$$f(x)=\begin{cases} x+2 & \text{if } x<-1 \\ x^2 & \text{if } -1\leq x\leq 2 \\ 3 & \text{if } 2<x\leq 6 \end{cases}$$

b)



$m = \frac{-4-2}{-3-2} = \frac{-2}{-1} = 2$

$y=2x+b$
$-2=2(-2)+b$
$2=b$
$y=2x+2$

$$f(x)=\begin{cases} 2x+2 & \text{if } x<-2 \\ 3 & \text{if } -2\leq x<3 \\ -x & \text{if } x\geq 3 \end{cases}$$

D: $(-\infty,\infty)$ R: $(-\infty,-2) \cup [3]$
zeros: None

3. Evaluate the following piecewise function at the given values. Then graph the piecewise function and find the domain, range, and zero(s) if any exist.

$$f(x) = \begin{cases} 4 & if\ -5 \le x < -1 \\ x^2 - 3 & if\ -1 \le x < 2 \\ -2x + 7 & if\ x \ge 2 \end{cases}$$

$f(10) =$ -13

$f(0) =$ -3

$f(-1) =$ -2

$f(2) =$ 3

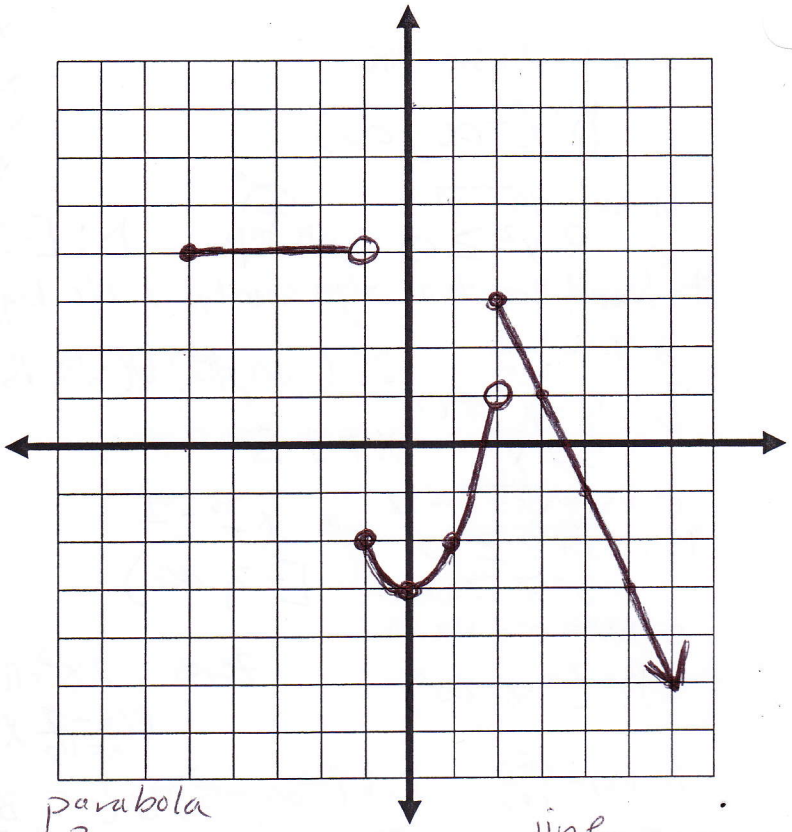
$f(-4) =$ 4

$f(-7) =$ Undefined

Domain: $[-5, \infty)$

Range: $(-\infty, 3] \cup [4]$

Zeros: $(\sqrt{3}, 0)\ (7/2, 0)$ →



parabola
$x^2 - 3 = 0$
$x^2 = 3$ — only the pos one on graph
$x = \pm\sqrt{3}$

line
$-2x + 7 = 0$
$-2x = -7$
$x = 7/2$

4. Evaluate the step function at the given values. Then graph the function.

space btw steps ↓ ← Down 5

$g(x) = 3[\![x + 2]\!] - 5$

↑ left 2

$g(3) =$ 10

$g\left(\frac{5}{2}\right) =$ 7

$g(-1.2) =$ -5

$g(-7.4) =$ -23

$g(-2.3) =$ -8

$g(1.6) =$ 4