1. [10] TRUE/FASLE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let f & g, be functions, and x & y be real numbers not equal to zero.

T F $\frac{2x+1}{2y} = \frac{x+1}{y}$ if 2 was a factor of the numerator then T

T F All functions pass the vertical line test by def of function

T F The lines described by $y = -\frac{1}{3}x + 1$, and $\frac{1}{3}y - 2 = x$ are perpendicular.

slope $= -1/3$ Slope $= 3$

$\frac{1}{3}y - 2 = x$

$\frac{1}{3}y = x + 2$

$y = 3x + 6$

T F The vertex of $f(x) = -x^2 + 2$, is at the point $(0, 2)$. shifted up 2 units.

T F $(f + g)(x) = f(x) + g(x)$ by definition

T F $f(x + y) = f(x) + f(y)$ let $f(x) = x + 1$

T F Let $v, w > 0$, then $\log v + \log w = \log(v + w)$ $\log v + \log w = \log(v \cdot w)$

T F Let v & w be real numbers, then $\sin v + \sin w = \sin(v + w)$

$\sin(v+w) = \cos v \sin w + \sin v \cos w$

T F $y^{\frac{1}{2}} = y^{-2}$ $y^{1/2} = \sqrt{y}$ $y^{-2} = \frac{1}{y^2}$

T F $\tan x + \cot x = \sec x \csc x$

$\frac{\sin x}{\cos x} + \frac{\cos x}{\sin x} = \frac{\sin^2 x + \cos^2 x}{\cos x \sin x} = \frac{1}{\cos x \sin x} = \frac{1}{\cos x} \cdot \frac{1}{\sin x}$

Correct answers will *not* get credit without supporting work. Note that "undefined" and "no solution" are possible answers.

2. [4] (Practice Exam #1) Solve for x.

$$x(5 + x^2)^{-\frac{1}{2}} = 1$$

$\frac{x}{\sqrt{5+x^2}} = 1$

$x = \sqrt{5+x^2}$

$x^2 = 5 + x^2$

$0 = 5$ contradictions

There are no real solutions

F should have choosen

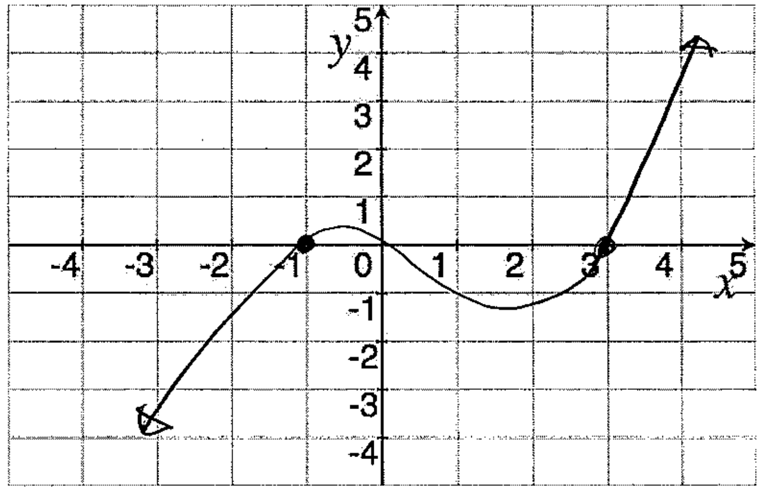
$\frac{x}{\sqrt{5-x^2}} = 1$

3. [4] Draw the graph of a function h that satisfies the following:

(a) h is a polynomial function

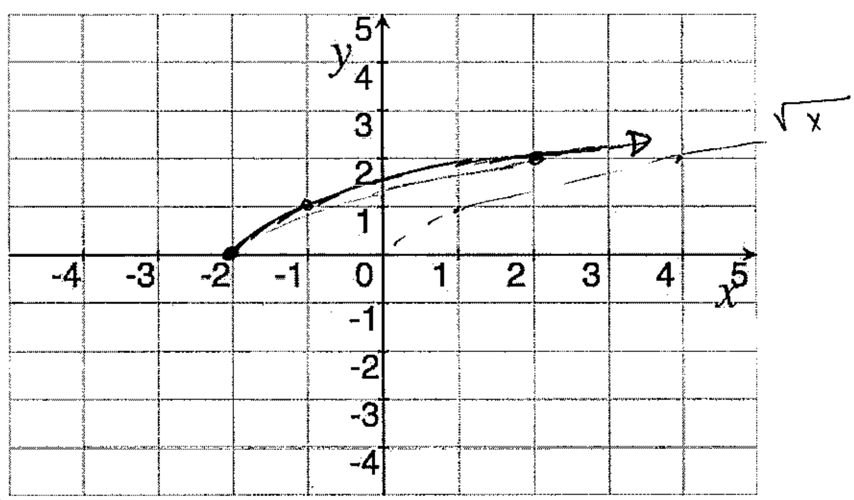
(b) -1 and 3 are roots of h

(c) $h(x) \to \infty$ as $x \to \infty$



4. (Practice Exam #3) Let $f(x) = x^{-1}$, and $g(x) = \sqrt{x+2}$,   shift to the left by 2

(a) [2] *Carefully* graph g.



(b) [1] (§1.2 #19)Find the domain of g.

$[-2, \infty)$

(c) [1] (§1.2) Find the range of g.

$[0, \infty)$

(d) [1] (§1.4) Find the rule of $(f \circ g)(x)$.

$(f \circ g)(x) = f(g(x)) = f(\sqrt{x+2}) = (\sqrt{x+2})^{-1} = \frac{1}{\sqrt{x+2}}$

(e) [2] (§1.4) Find the domain of $(f \circ g)(x)$.

all #'s so that

denominator $\neq 0$ AND   square root needs nonneg #

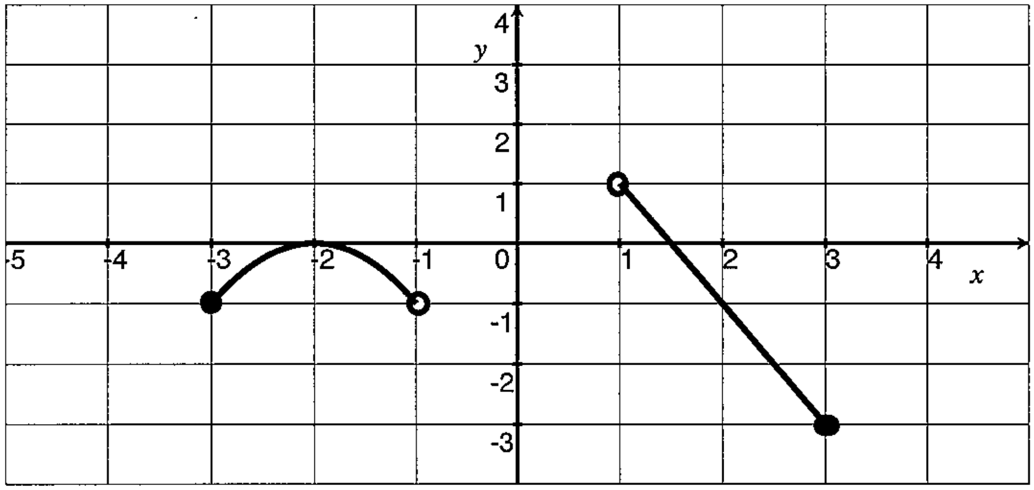
$\sqrt{x+2} \neq 0$ $x+2 \geq 0$

$x+2 \neq 0$ $x \geq -2$

$x \neq -2$

So $(-2, \infty)$

5. (Practice Exam #4 & 5) Let the following be the complete graph of f.



(a) [5] The function f is a piecewise defined function consisting of a straight line and a portion of a parabola. Write down the rule for f.

parabola: vertex $(-2,0)$

$a(x-{-2})^2+0=y$

$a(x+2)^2=y$

passes through $(-3,-1)$

$a(-3+2)^2=-1$

$\rightsquigarrow a=-1$

so $-(x+2)^2=y$

line: slope $=-2$

passes through $(2,-1)$

so

$-2(2)+b=-1$

$\rightsquigarrow b=3$

so $-2x+3=y$

So

$f(x)=$ $(x+2)^2$

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

(b) [3] (§1.2) Estimate the following *if* possible:

$f(-3)$

≈ -1

$f(-3)+f(3)$

$\approx -1+-3=-4$

(c) [2] (§1.2) Find the x value(s) so that $f(x)=-1$?

ie when does

$-(x+2)^2=-1$ and $-2x+3=-1$

$(x+2)^2=1$

$x+2=\pm 1$

$\rightarrow x=-3$ or $\cancel{-1}$

domain problems

$-2x=-4$

$x=2$

so at $x=-3$ & 2