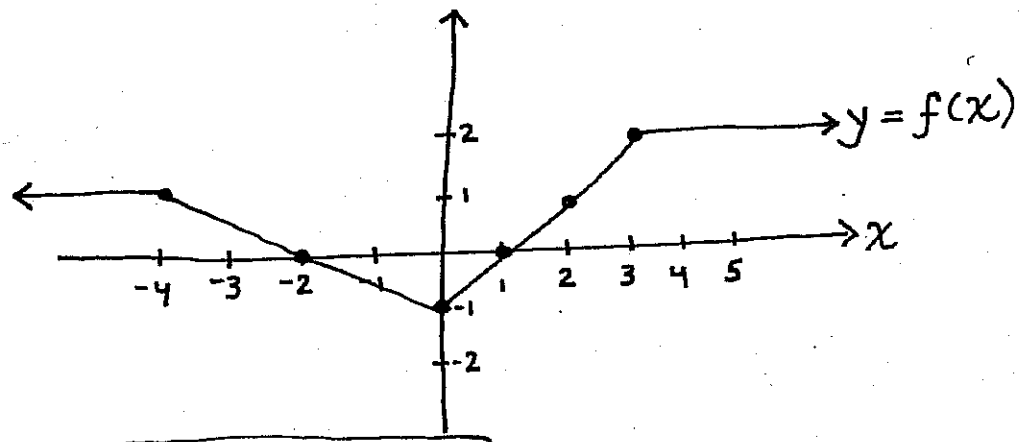
BONUS ASSIGNMENT
FUNCTIONS
943 - DW ELECTROTECH
SOLUTIONS

(1)



(a) DOMAIN $\mathbb{R}$
RANGE $[-1, 2]$

(b) $f(-1) \doteq -0.5$

(c) $f(3) = 2$
$f(2) = 1$
so $f(3) = 2f(2)$

(d) WHEN $x = -2$ & $x = 1$ $f(x) = 0$

(2) $f(x) = 2x^2 - 1$ & $g(x) = -x + 3$

(a) $f(-3) + g(2)$
$= (2(-3)^2 - 1) + (-2 + 3)$
$= 17 + 1 = \boxed{18}$

(b) $f(a^2) + g(a^4)$
$= (2(a^2)^2 - 1) + (-a^4 + 3)$
$= 2a^4 - 1 - a^4 + 3$
$= \boxed{a^4 + 2}$

(c) $f(g(x))$
$= f(-x + 3)$
$= 2(-x + 3)^2 - 1$
$= 2(-x + 3)(-x + 3) - 1$
$= 2(x^2 - 6x + 9) - 1$
$= \boxed{2x^2 - 12x + 17}$

(d) $g(f(x))$
$= g(2x^2 - 1)$
$= -(2x^2 - 1) + 3$
$= \boxed{-2x^2 + 4}$

(e) DOMAIN $f : \mathbb{R}$ $g : \mathbb{R}$
RANGE $f : (-\infty, -1]$ $g : \mathbb{R}$

③ (a) $f(x) = \sqrt{1-x}$ DOMAIN: $\boxed{(-\infty, 1]}$

RANGE: $[0, \infty)$

(b) $f(x) = \dfrac{4}{\sqrt{1-x}}$ DOMAIN: $\boxed{(-\infty, 1)}$

* NOTE $x=1$ IS NO LONGER IN THE DOMAIN SINCE IT CAUSES DIVISION BY 0

(c) $f(x) = \dfrac{1}{2x^2-5x-3}$

WHEN IS THE DENOMINATOR 0?

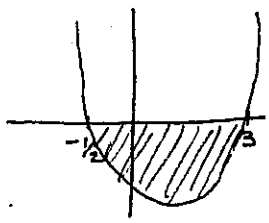
$$2x^2-5x-3=0$$
$$2x^2-6x+x-3=0$$
$$2x(x-3)+1(x-3)=0$$
$$(x-3)(2x+1)=0$$
$$x=3 \quad x=-\tfrac{1}{2}$$

DOMAIN: $\boxed{(-\infty, -\tfrac{1}{2}) \cup (-\tfrac{1}{2}, 3) \cup (3, \infty)}$

OR WRITTEN AS $\mathbb{R} \setminus \{-\tfrac{1}{2}, 3\}$

(d) $f(x) = \dfrac{1}{\sqrt{2x^2-5x-3}}$

WE WANT TO DETERMINE WHEN WE WILL HAVE A NEGATIVE UNDER THE SQUARE ROOT



WE SEE THAT THE QUADRATIC IS NEGATIVE BETWEEN $-\frac{1}{2}$ & 3 SO

DOMAIN: $\boxed{(-\infty, -\tfrac{1}{2}) \cup (3, \infty)}$

④ SKETCH

(a) $y = -x^2 - 2x - 3$

- y-INTERCEPTS $x = 0$ $\quad y = -3$
- x-INTERCEPTS $y = 0$ $\quad 0 = -x^2 - 2x - 3$

$$0 = x^2 + 2x + 3$$

QUADRATIC FORMULA

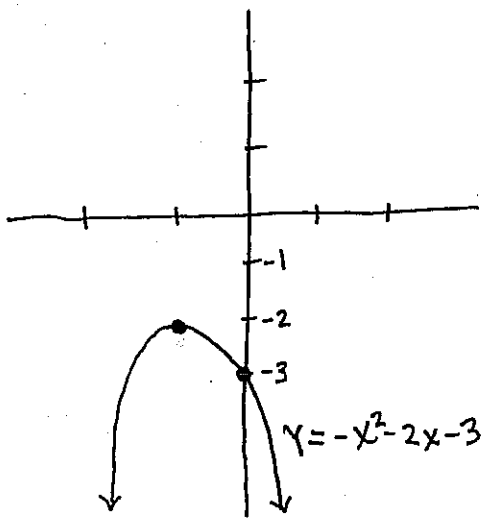
$$x = \frac{-2 \pm \sqrt{2^2 - 4(1)(3)}}{2(1)}$$

NO SOLUTIONS SO NO x-INTERCEPTS

- VERTEX

$$x = \frac{-b}{2a} = \frac{2}{2(-1)} = -1 \qquad y = -(-1)^2 - 2(-1) - 3 = -1 + 2 - 3 = -2$$

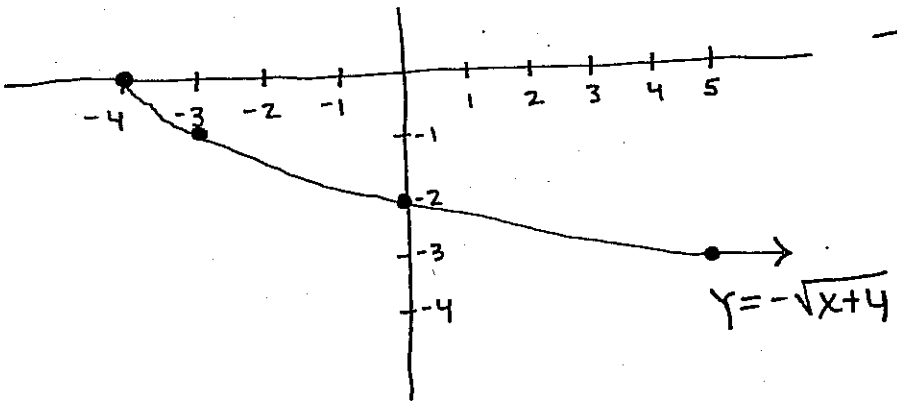
$(-1, -2)$



(b) $y = -\sqrt{x+4}$

TABLE OF VALUES

x	y
-4	0
-3	$-\sqrt{1} = -1$
0	$-\sqrt{4} = -2$
5	$-\sqrt{9} = -3$



(5) INJECTIVE

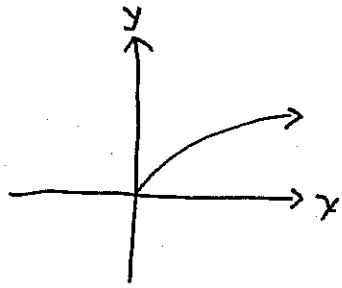
(a) $Y = X^2 - 1$

NOT injective

$X = -1$ and $X = 1$ both map to $Y = 0$

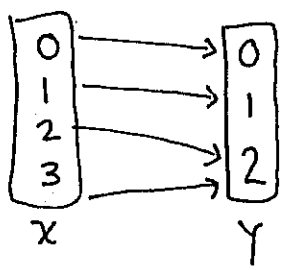
TWO x-values, ONE y-VALUE

(b) $Y = \sqrt{X}$ INJECTIVE



EVERY y-value
ONE x-value

(c)



NOT INJECTIVE

$Y = 2$

TWO x-VALUES go TO IT

$X = 2$ & $X = 3$!