

MTHAU Assignment #1 Solution: (Functions)

1. b) is a polynomial function, because it follows general shape of a parabola, or quadratic, function. a), c) are not polynomial functions because they do not follow the general shapes of known polynomial functions.

③

1 per item, get it right and explain.

2. a) $f(x) = x^2 + 3x - 2$ follows the polynomial pattern of $f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$, being a quadratic with $f(x) = a_2 x^2 + a_1 x + a_0$ where $a_2 = 1$, $a_1 = 3$, $a_0 = -2$.
* 'FD method' also accepted.

②

- b) $y = \frac{x^2 - 4x + 1}{x + 2}$ is not a polynomial function as it does not follow the general form of polynomials.

②

3.

(Time) x	(Height) y	1 st FD	2 nd FD
0	10		
1	25		
2	30		
3	25		
4	10		

Uniformly distributed

1st FD calculations:
 $25 - 10 = 15$
 $30 - 25 = 5$
 $25 - 30 = -5$
 $10 - 25 = -15$ ①

2nd FD calculations:
 $5 - 15 = -10$
 $-5 - 5 = -10$
 $-15 - (-5) = -10$ ①

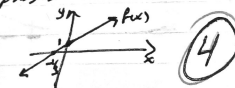
2nd FD $\Rightarrow$ degree 2 polynomial $\Rightarrow$ quadratic.

④

4. a) yes, injective.
 $D: \{1, 3, 5, 7\}$
 $R: \{2, 4, 6\}$
- b) No, not injective.
 $D: \{1, 10, 100\}$
 $R: \{0, 1, 3\}$
- c) No, not injective.
 $D: \{8, 6, 8\}$
 $R: \{5, 1, 7, 5\}$

⑥

5. a) No, fails vertical line test.
 $D: \{x \in \mathbb{R} \mid x \geq 2\}$
 $R: \{y \in \mathbb{R}\}$
- b) Yes, injective and passes vertical line test.
 $D: \{x \in \mathbb{R}\}$
 $R: \{y \in \mathbb{R}\}$

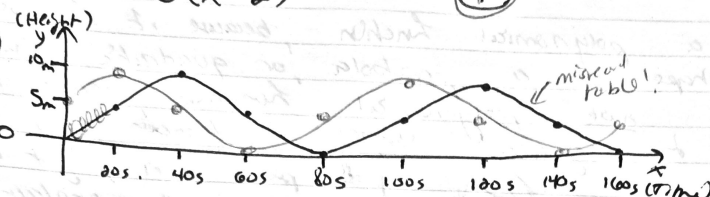


④

6. $f(x) = 3(x-2)$

①

7. a)



*units + labels required!

②

b) D: $\{0, 20, 40, 60, 80, 100, 120, 140, 160\}$
R: $\{0, 5, 10\}$

cor mgd notation!

②

⑦

c) Yes, injective + passes vertical line test.

①

d) Flipped / rotated version of a). NOT a function, fails vertical line test.

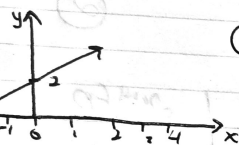
②

8. a) $|x| \geq 2$

b) $|x| < 4$

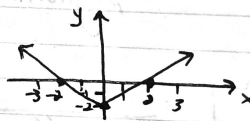
②

9. a)



②

b)



②

* need at least x, y intercept

④

10. a) $f(x) = \frac{1}{x}$, $g(x) = x$

ex. Both functions are odd

• $f(x)$ has asymptote, $g(x)$ does not.

b) $f(x) = 2^x$, $g(x) = |x|$

ex. $f(x)$ is even, $g(x)$ is neither even nor odd. both are continuous.

④

11. a) $f(x) = x^2 - 4$

$f(-x) = x^2 - 4 = f(x) \Rightarrow$ even

$-f(-x) = -f(x)$

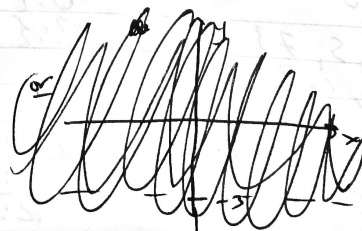
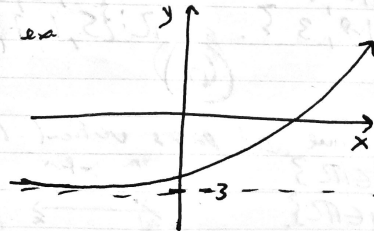
b) $f(x) = \frac{1}{x} - x$

$f(-x) = -\frac{1}{x} + x$

$-f(-x) = \frac{1}{x} - x = f(x) \Rightarrow$ odd

④

12. ex



③