



جامعة الأميرة نورة بنت عبد الرحمن
Princess Nourah Bin Abdulrahman University

Study plan for the course Calculus 1 (Math101T)

Main reference:

H. Anton, I. Bivens, and S. Davis, Calculus: Late transcendentals, 9th Edition, John Wiley and Sons (2005).

Weeks	Sections and topics	Examples
1 st week	Revision Exercise sheet 1	In the presentation
2 nd week	<p>0.1 Functions</p> <ul style="list-style-type: none"> • Definition of a function (four points which are given as examples of function representation are not required in this subsection) • Independent and dependent variables • Graphs of functions • The vertical line test • The absolute value function • Piecewise-defined function • Domain and range • The effect of algebraic operations on the domain <p>Exercise set 0.1: 1 from quick check exercises p.11 3, 4, 7, 8 (a), 9 (a,b,c), 10 (b, d, e), (15, 16, 17, 18 without the part of determining a formula for y in term of x) 19, 20, 21, 22 p.12-13.</p>	<p>Example: 1,2,3,6,7,8 Exercise 8 (b) without $g(t^2 - 1)$</p> <p>Find the domain and the range of the following functions:</p> $f(x) = \pm x^2$ $f(x) = \pm \sqrt{x}$ $f(x) = \frac{1}{x}$ $f(x) = \sqrt{x^2 - 2}$ $f(x) = \sqrt{2 - x^2}$

Q) Find the domain and the range of the following function :

1) $f(x) = \pm x^2$

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

Domain:

$$D = (-\infty, +\infty)$$

Range:

$$R = [0, +\infty)$$



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

Domain:

$$D = (-\infty, +\infty)$$

Range:

$$R = (-\infty, 0]$$

$$2) f(x) = \pm \sqrt{x}$$

$$f(x) = \sqrt{x}$$

Domain:

$$x \geq 0 = [0, +\infty)$$

Range:

$$f(0) = \sqrt{0} = 0$$

$$f(1) = \sqrt{1} = 1$$

$$R = [0, +\infty)$$

$$f(x) = -\sqrt{x}$$

Domain:

$$x \geq 0 \Rightarrow [0, +\infty)$$

Range:

$$f(0) = -\sqrt{0} = 0$$

$$f(1) = -\sqrt{1} = -1$$

$$R = (-\infty, 0]$$



$$3) f(x) = \frac{1}{x}$$

Domain:

$$x \neq 0 \Rightarrow \mathbb{R} \setminus \{0\}$$

Range:

$$f(x) \in \mathbb{R} \setminus \{0\}$$



$$4) f(x) = \sqrt{x^2 - 2}$$

Domain:

$$x^2 - 2 \geq 0$$

$$x^2 \geq 2 \Rightarrow \sqrt{x^2} \geq \sqrt{2}$$

$$|x| \geq \sqrt{2} \Rightarrow |x| \geq \sqrt{2} \text{ or } |x| \leq -\sqrt{2}$$

$$D = (-\infty, -\sqrt{2}] \cup [\sqrt{2}, +\infty)$$

Range:

$$f(\sqrt{2}) = \sqrt{(\sqrt{2})^2 - 2} = \sqrt{2 - 2} = 0$$

$$f(-\sqrt{2}) = \sqrt{(-\sqrt{2})^2 - 2} = \sqrt{2 - 2} = 0$$

$$f(3) = \sqrt{3^2 - 2} = \sqrt{9 - 2} = \sqrt{7} = 2.7$$

$$R = [0, +\infty)$$

قانون

$$|a| \geq b \Rightarrow a \geq b \text{ or } a \leq -b$$

$$5) f(x) = \sqrt{2-x^2}$$

Domain:

$$2-x^2 \geq 0 \Rightarrow 2 \geq x^2$$

$$x^2 \leq \sqrt{2} \Rightarrow \sqrt{x^2} \leq \sqrt{\sqrt{2}}$$

$$|x| \leq \sqrt{2} \Rightarrow -\sqrt{2} \leq x \leq \sqrt{2}$$

$$D = [-\sqrt{2}, \sqrt{2}]$$

Range:

$$f(-\sqrt{2}) = \sqrt{2 - (-\sqrt{2})^2} = \sqrt{2-2} = 0$$

$$f(0) = \sqrt{2-0^2} = \sqrt{2}$$

$$f(\sqrt{2}) = \sqrt{2 - (\sqrt{2})^2} = \sqrt{2-2} = 0$$

$$R = [0, \sqrt{2}]$$

قانون

$$|a| \leq b \Rightarrow -b \leq a \leq b$$