

MATH 30 PRECALCULUS FIRST TEST. FALL 2011

Exercise 1. Explain whether or not the following relations represent functions. In case of being functions are they one-to-one?

a. $\{(1, 3); (2, 4); (3, 4); (5, 5)\}$ b. $\{(1, 3); (2, 4); (3, 4); (3, 5)\}$

c. $\{(x, y) : x^2 + y^2 = 25\}$ d. $\{(x, y) : x + y = 9\}$

Exercise 2. Given the functions $f(x) = 4x + 2$ and $g(x) = x^2 - 3x - 4$ find:

1. $f(g(x))$ 2. $g(f(x))$

3. $g(x) \cdot f(x)$ 4. $(f/g)(-2)$

5. $3x^2 - 4x + 1 - g(x)$ 6. $f(x) + g(x)$

7. $f(x) = \frac{g(x+h) - g(x)}{h}$

Exercise 3. Determine which of the following functions is even, odd or neither.

1. $f(x) = 3x^2 - 5x^8$ 2. $g(x) = -2x + 2x^3$

3. $h(x) = x^2 - 4x + 2$ 4. $k(x) = x(3 \sin x - 5x)$

Exercise 4. Find the inverse of the following functions:

1. $f(x) = 3x + 7$ 2. $f(x) = \frac{2x - 3}{4x + 5}$

3. $h(x) = x^3 + 6$

Exercise 5. Sketch graph of function $f(x) = 2x^2 - 4x - 6$. Include computation of zeroes, y-intercept and vertex. Find the range and argue why this function is not one-to-one. Can you see a smaller domain in which this function will be one-to-one?

Exercise 6. Use the graph of each of the following functions and find its range:

1. $f(x) = 3x - 5$, with domain $(-1, 4]$ 2. $g(x) = -2x + 1$, with domain $[2, 5]$

3. $h(x) = x^2 - 4x + 2$, with domain $[-5, 6)$ 4. $k(x) = 3 \sin x - 5$, with domain $[-2\pi, \pi]$

Exercise 7. Graph the following functions using SAGE and determine the intervals where they are increasing or decreasing.

1. $y = x^3 - x^2 - 4x + 4$ 2. $y = \cos x$

3. $y = \frac{x}{x^2 + 1}$ 4. $y = \frac{x}{x^2 - 1}$

Exercise 8. Find the domain of the following functions:

1. $f(x) = \sqrt{x - 5}$

2. $g(x) = \sqrt[3]{5x - 10}$

3. $f(x) = \frac{2x - 3}{4x + 5}$

4. $f(x) = \log_3(5x - 2)$

Then use SAGE to graph the functions.