

Practice Midterm #2

(Mostly) Functions and Graphs

Topics Covered

Section	Topic	Reference
Inequalities	Inequalities	SRW 1.7
Functions	Domain/Range	SRW 2.1
	Evaluation	SRW 2.1
	Difference Quotient $\frac{f(a+h)-f(a)}{h}$	SRW 2.1
	Piecewise-Defined or Split-Domain Functions	SRW 2.2
	Absolute Value as a Split-Domain Function	SRW 2.2 (and notes)
	Composition and Inverse Functions	SRW 2.6, 2.7
Graphs	Lines $y = mx + b$	SRW 1.10
	Parabolas $y = A(x - h)^2 + k$ or $x = A(y - k)^2 + h$	SRW 2.4, Notes
	Circles $(x - h)^2 + (y - k)^2 = r^2$	SRW 1.8
	Graph Transformations	SRW 2.4

1. Solve the given inequality.

a. $y^2(y - 7) < -6y$

b. $\frac{r + 3}{r - 7} \geq 3$

c. $\frac{2x}{x - 2} > \frac{x}{x - 3} + 1$

2. Find the domains of the following functions.

a. $f(x) = \frac{2x+1}{x^2+4x-12}$

b. $f(x) = \sqrt{9x - x^3}$

c. $f(x) = \sqrt{x+2} - 3\sqrt{5-3x}$

d. $f(x) = \frac{4}{x^2+8x+16}$

e. $f(x) = \sqrt[3]{-4 - 5x^2}$

f. $\sqrt{\frac{x^2+5x+4}{3x-1}}$

3. Let f be the function given by $f(x) = 3x - \frac{2}{1-x}$. Evaluate:

a. $f(-1)$

b. $f(4)$

c. $f(-x)$

d. $f(5+h)$

4. Calculate and simplify the difference quotient $\frac{f(-2+h)-f(-2)}{h}$ for the given function f .

a. $f(x) = 5x - 3$

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

5. a. Write $f(x) = |5 - 10x| - 8$ as a split-domain function (and simplify).

b. Graph the following Split-Domain function. Make sure to be precise about what happens near $x = 1$.

$$f(x) = \begin{cases} 3 - (x - 1)^2, & \text{if } x < 1; \\ 10 - 2x, & \text{if } x \geq 1 \end{cases}$$

6. For $f(x) = 3x+5$ and $g(x) = 1/(x-2)$ and $h(x) = \sqrt{x}$ work out the following compositions.

a. $f \circ g(x)$

b. $g \circ f(x)$

c. $h \circ g(x)$

d. $g \circ f \circ h(x)$

7. For each of the following functions h come up with two functions f and g such that $h = g \circ f$.

a. $h(x) = \sqrt{6-x^3}$

b. $h(x) = (2-x)^4 + 3(2-x)$

c. $h(x) = \frac{4}{1-4\sqrt{x}}$

d. $h(x) = |x^4 + 9|$

8. a. Verify that the following pair of functions are inverses. Then graph both functions.

$$f(x) = x^2 - 4, \quad x \geq 0$$

$$g(x) = \sqrt{x + 4}, \quad x \geq -4$$

b. Find the inverse of the following functions.

$$f(x) = 4 - 8x$$

$$f(x) = \frac{2}{x+3}$$

9. a. Graph the line perpendicular to $3x + y = 6$ but through the point $(-5, 2)$. Then find the equation.

b. Graph the line through the points $(-3, 8)$ and $(5, 4)$. Then find the equation.

10. Graph the following equations.

a. $x = -2y^2 - 12y - 15$

b. $x^2 + y^2 - 4x + 10y - 7 = 0$

c. $5y = x^2 - 6x + 4$

11. Graph the first function from memory. Then graph the second function by applying one or more graph transformation.

a. $f(x) = 1/x^4$ and then $f(x) = 1/x^4 - 16$

b. $f(x) = |x|$ and then $f(x) = 5 - |x + 4|$

c. $f(x) = x^5$ and then $f(x) = (2 - x)^5$