MATH 1450 Exam I practice problems*

1 Section 1.1

11 Find the and the midpoint and the distance between the points $P(0, -1), Q(-3, 5)$.

17 Are these three points collinear? Why? $(1, 1), (2, 3), (4, 7)$.

27 Which one of these points are on the graph of the equation? $(3, 2), (3, 4), (0, 1), (0, 0)$.

$$y^2 - x - 1 = 0$$

31 Plot the graph of the equation using a table. $y = -\sqrt{9/x^2}$.

45 Find the x and y intercepts of the graph of the equation $x = y^2 - 5y + 5$.

71 Find the center and radius of the circle $2x^2 + 2y^2 + 4y = 0$, then find its x and y intercepts.

83 The equation $P = -0.002t^2 + 0.093t + 8.18$ models the approximate number of female college students in the US for the academic years 1995-2001, with $t = 0$ representing 1995.

- sketch the graph of the equation.
- Find the positive $t-$intercept. What does it represent?
- Find the $P-$intercept. What does it represent?

94 Graph the equation: $(y - 2x)(x^2 + y^2 - 4) = 0$

2 Section 1.2

9 Find the slope of the line through points $(1, 3), (2, -3)$.

27 Find the equation of the line through points $(1, 3), (2, -3)$.

49 Find the equation of the line through $(1, 1)$, perpendicular to the line in previous problem.

*The numbers denote the similar problems from the book.

51 Write the following equation in the slope-intercept form: $3x - 2y + 6 = 0$.

59 Find the intercepts of the line $\frac{x}{a} + \frac{y}{b} = 1$.

60 Write the equation in general form of the line with $x-$intercept 4 and $y-$intercept 3.

75 Find the equation of the line passing trough (5,-4) and parallel to $y = -1$.

95 The number of the females in Florida's prison rose from 2425 in 2000 to 4026 in 2006.

- Find a linear equation relating the number of women prisoners to the year t. ($t = 0$ for year 2000)
- Draw the graph of the equation.
- How many women prisoners were there in 2003?
- Predict the number of women prisoners in 2100.

120 Draw the graph of the equation $(x-1)(x-2) + (y-2)(y-3) = 15.5$.

3 Section 1.3

15 Determine whether the equation defines y as a function of x: $yx = 1$.

28 Determine whether the equation defines y as a function of x: $x + y^3 = 1$.

35 Find the domain:

- $f(x) = \frac{2x}{x-1}$.
- $f(x) = \frac{2x}{\sqrt{x-1}}$.
- $f(x) = \frac{\sqrt{3-x}}{x-1}$.
- $f(x) = \frac{\sqrt{1-x}}{x-3}$.

63 Find the average rate of change for $f(x) = (3-x)^2$ from -3 to 3.

75 Compute the difference quotient for $f(x) = \frac{-1}{x}$.

93 Is the total surface area S of a cube a function of the edge x of the cube? If it is not, explain why not. If it is a function, write the function $S(x)$ and evaluate $S(3)$.

106 Explain whether f and g represent the same function: $f(x) = (\sqrt{(x)})^2, g(x) = x$.

126 Write the equation of two different functions where their implied domain is $(-\infty, 2)$.

4 Section 1.4

19 Sketch the graph and fund the intervals over which the function is increasing, is decreasing, or is constant: $f(x) = -\sqrt[3]{x}$.

37 Determine whether the function is odd, is even, both, or neither one: $f(x) = \frac{1}{x^2+4}$.

37 Determine whether the function is odd, is even, both, or neither one: $f(x) = \frac{x}{x^2+4}$.

51 Let

$$f(x) = \begin{cases} 2x & \text{if } x \geq 2, \\ 2 & \text{if } x < 2 \end{cases}$$

- Find $f(1), f(2), f(3)$.
- Sketch the graph of the function.
- Find the range of the function.

64 The speed V of sound in air at temperature T is given by the linear function $V(T) = 1055 + 1.1T^2$.

- Find the speed of the sound at 90 degrees.
- Find the speed of sound at which the speed of sound is 1100.
- In order to increase the speed of sound, should the temperature increase, or decrease?

77 Let $f(x) = \frac{|x|}{x}, x \neq 0$, and $g(x) = x - [\![x]\!]$.

- Find the domain and range of f and g.
- Find the intervals over which the function is increasing, decreasing, or constant.
- State whether the function is odd, even, both, or neither one.

5 Section 1.5

7 Describe the transformations that produce the graph of $y = -2(x+1)^3+2$ from the graph of $y = x^3$.

33 Draw the graph of the function $f(x) = 1 - 2\sqrt{x}$.

63 Right an equation for a function whose graph is the graph of $f(x) = x^3$ shifted three units left, reflected in the $x-$axis, and shifted two units down.

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82 Suppose the employees making $\$30,000$ or more received 2% raise and an additional \$500, while those making less than $\$30,000$ received a 10% raise. Write a piecewise function to describe the new salaries.

99 Sketch the graph of $y = |4 - x^2|$.

106 If f is a function with $x-$intercept 4 and $y-$intercept -1, find the corresponding x and y intercepts for

- $f(x+2)$
- $f(-x)$
- $-f(x)$
- $5f(x)$
- $5f(x)+3$
- $5f(x-2)+3$
- $-5f(2x-2)+3$

6 Section 1.6

7 If $f(x) = 1 - x^2, g(x) = 2x + 1$ find $(f+g)(0), (fg)(1), (f/g)(-1), f \circ g(5)$.

33 If $f(x) = \frac{1}{x-1}, g(x) = \frac{2}{\sqrt{x+3}}$, find $f \circ g$ and its domain.

53 Write $H(x) = \sqrt{3x^2} + 3$ as a composition of two non-trivial functions f, g, such that $H(x) = f \circ g(x)$. Then compute $g \circ f(x)$.

73 The area A of a circular disk of radius r is given by $A = f(r) = \pi r^2$. Suppose a metal disk is being heated and its radius is increasing according to the equation $r = g(t) = 2t + 1$, where t is time in hours. Find $f \circ g(t)$. Determine A as a function of time. Then compare these two function.

77 True/False: (give enough reasoning)

- If f and g are odd then $f \circ g$ is odd.
- If f and g are odd then $f \circ g$ is even.
- If f and g are even then $f \circ g$ is even.
- If f and g are even then $f \circ g$ is odd.

81 If $f(x) = \sqrt{4 - x}$, find the domain of $f \circ f$.

7 Section 1.7

15 Let f be a one-to-one function. If $f(2) = 2$, then find $f^{-1}2$. If $f(3) = 0$, then find $f^{-1}(0)$.

27 For $f(x) = x^3 + 1$, find $f(2), f^{-1}(9), f \circ f^{-1}(5), f^{-1} \circ f(111)$.

29 Verify that $f(x) = \frac{x-1}{x+2}$ and $g(x) = \frac{1+2x}{1-x}$ are inverses of each other.

43 Determine whether the function $f(x) = \sqrt{4 - x^2}$ is one-to-one.

55 Assume that $f(x) = \frac{x}{1-x}, x \neq 1$ is one-to-one. Find its inverse. Find range of f.

87 Sketch the graph of the function $g(x) = (x-1)^3 + 2$. Find $g^{-1}(x)$. Sketch the graph of g^{-1}.

8 Section 2.1

17 Find the quadratic function of the form $f(x) = ax^2$ passing through $(-2, 8)$.

21 Find the quadratic function with vertex $(2, 5)$ and passing through $(3, 7)$.

35 Graph the function $y = -3x^2 + 18x - 11$ by writing it standard form. Find the $x-$intercepts of the function.

43 Determine if the function $y = x^2 - 18x + 15$ opens up or down. Find its vertex, find its axis of symmetry, and sketch the graph of it. Does the function have a maximum or a minimum? At what point? What is the value of it?

59 Solve the inequality by sketching the graph of an appropriate function: $x^2 + 2 - 2 > 0$.

59 Solve the inequality by sketching the graph of an appropriate function: $x^2 + 2 - 2 \geq 0$.

69 Find the dimensions of a rectangle of maximum area if the perimeter of the rectangle is 80cm. What is the maximum area?

70 Product of two numbers is 25, their sum is at least ____________.

89 Find two quadratic functions, one opening up and the other down, whose graphs have $x-$intercepts -2,6.

93 $f(x) = 4x - x^2$. Solve $f(a+1) - f(a-1) = 0$.

9 Section A.6

57 A farmer can plow his field by himself in 15 days, if his son helps, they can do it in 6 days. How long would it take his son to plow the field by himself?

58 An open box is to be constructed from a rectangular sheet of tin 3 meters wide by cutting out a 1 meter square from each corner and folding up the sides. The volume of the box is to be 2 cubic meters. What is the length of the tin rectangle?

10 Section A.8

5 Solve the equation by factoring: $x^2 - 5x = 0$.

15 Solve the equation by factoring: $5x^2 + 12x + 4 = 0$.

25 Solve by square root method: $2(x-1)^2 + 1 = 5$.

35 Add a constant to make it a perfect square: $x^2 - 3.5x + 1$.

45 Solve the equation by completing the square: $5y^2 + 10y + 4 = 2y^2 + 3y + 1$.

59 Solve using the quadratic formula: $t(t+1) = 3t^2 + 1$.

75 Find the discriminant and determine the number and type of roots of $17x - 12 = 6x^2$.

83 Find k such that $x^2 - kx + 3 = 0$ has equal roots.

91 Find k such that the sum and the product of the roots are equal $2x^2 + (k-3)x + 3k - 5 = 0$.

95 The length of a rectangle is 5cm greater than its width. The area of the rectangle is 500cm^2. Find the dimensions of the rectangle.