

# Review for FINAL Exam

MATH 150  
1.1 through 10.3

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1. Determine the quadrant of  $(x, y)$  if  $(x, -y)$  is in quadrant II.

# 2-3. Given  $P = (4, 6)$  and  $Q = (-4, 10)$

2. Find the equation of the perpendicular bisector of  $PQ$ .

3. Find the equation of the circle whose diameter is  $PQ$ .

4. Given:  $x^2 + 8x + y^2 - 6y - 12 = 0$ ; find the radius and center of the circle.

5. Match the equation with its graph:  $a > 0$

a.  $y = ax^3 + bx^4 + c$

b.  $y = -ax^2 + bx + d$

c.  $y = -(x - a)^2 + b$

d.  $y = -ax + e$

6. Write the equation of the parabola whose vertex is  $(3, -4)$  which passes thru  $(-1, 2)$ .

7. Write the equation of the line perpendicular to  $x - 2y + 6 = 0$  which passes thru  $(-3, 4)$ .

8. Assuming a linear demand curve, if you earned \$20,500 annually in 1986, and \$24,900 in 1998, what would you earn in 2003?

9. Solve:  $\sqrt{x} + \sqrt{x-5} = 5$

10. A rancher has 2300 ft of fencing for four adjacent corrals. Write a function for the area in terms of  $x$ , the width of a corral.

11. Solve:  $|8 - 2x| \leq 14$

12. Solve:  $|4 - 2x| \geq 2$

13. Find the domain of each of the following:

a.  $y = \sqrt{9 - x^2}$

b.  $y = \frac{x + 10}{x^2 - 25}$

14. Solve:  $\frac{3}{x-1} \leq 2$

Given  $f(x) = 2x^2 - 1$ , and  $g(x) = \sqrt{x-2}$

15. Find  $(f \circ g)(11)$

16. Find  $f^{-1}(7)$

17. T or F: If  $f$  is an odd function, its graph is a reflection about the  $y$  axis.

18. T or F: If  $f$  is an odd function,  $f^{-1}$  exists.

19. T or F: If  $f$  is a rational function, there is no function  $f$  such that  $f(x) = f^{-1}$

20. T or F: If  $f^{-1}$  exist, the  $y$ -intercept on  $f^{-1}$  is an  $x$ -intercept on  $f$ .

21. Find the inverse of:  $f(x) = \frac{x-2}{x+1}$ , if it exists.

22. Find the vertex of:  $f(x) = \frac{1}{2}x^2 + 4x - 2$

23. Find the vertical and horizontal asymptotes and holes of:

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

24. Change  $\sqrt{45}$  into rational form.

25. T or F: Non-negative is the same as positive.

26. T or F:  $1.\overline{9} = 2$

27. T or F: All straight lines with equal slopes are parallel.

28. T or F: All parallel lines have equal slopes.

29. The concentration of gold in the locket is 8%. How much silver should they add to change the concentration of gold to 5%, if the locket originally weighed 20 ounces?

30. Given:  $P$  varies jointly with  $Q$  and  $R$  and inversely with the square of the distance from the source of the heat. If  $P = 6$  when  $Q = 8, R = 9$ , and the distance is 6ft, write an equation which describes this relationship.

31. Solve:  $x^{4/5} - 4x^{2/5} - 12 = 0$

32. The table shows the number of CD players sold in a small store from 1990 to 2000. What was the average rate of change of sales from 1992 to 1996?

Year	# CD players
1990	582
1992	612
1994	660
1996	680
1998	742
2000	834

33. Describe the graph of  $y = \beta(x - \alpha)^2 + \gamma$

34. Graph:  $y = (x + a)(x - b)^2$

35. Find the remainder:  
$$\frac{x^4 - x^3 + x^2 - x + 2}{x - 2}$$

36. Given:  $P(x) = 6x^4 - x^3 - 32x^2 + 5x + 10$

- a. List all possible rational zeros of  $P(x)$ .

- b. List the possible number of positive real zeros of  $P(x)$ .

- c. List the possible number of negative real zeros of  $P(x)$ .
- d. Find the smallest upper bound for  $P(x)$ .
- e. Find the largest lower bound for  $P(x)$ .
- f. Find all the zeros of the function  $P(x)$ .

37. Evaluate  $\frac{2 - 3i}{4 + 5i}$

38. Find a polynomial with integer coefficients with zeros of 2 and  $1 - i$ .

39. The number of birds is limited by the type of habitat required for nesting. The population behaves according to the model:

$$n(t) = \frac{11200}{0.5 + 27.5e^{-0.044t}}, \text{ where } t \text{ is measured in years.}$$

1. Find the initial bird population.
2. What size does the population approach as time goes on?

40. If \$2475 is borrowed at  $6\frac{1}{4}\%$ , compounded monthly for 9 months, how much will be due?

41.  $e^{\ln \sqrt{3}}$

42.  $\ln\left(\frac{1}{e}\right)$

43. Solve:  $\log_4 \sqrt{2} = x$

**Find the domain:**

44.  $h(x) = \log_5(8 - 2x)$

45.  $g(x) = \ln(x - x^2)$

46.  $f(x) = \sqrt{x - 2} - \log_5(10 - x)$

47. Solve:  $\log_5 x + \log_5(x + 1) = \log_5 20$

48. Solve:  $\log_2(\log_3(\log x)) = 1$

49. Solve:  $e^{2x} - 3e^x - 40 = 0$

50. Solve:  $\frac{10}{1 + e^{-x}} = 2$

51. Find the phase shift of:  
 $y = 4 \sin(2x - \pi)$

52. Find the period of:  
 $y = 5 \sin(2x - \frac{\pi}{2})$

53. Find the amplitude of:  
 $y = \frac{-1}{2} \cos(3x - \frac{\pi}{4})$

54. Find the angle between  $\vec{u} = \langle -6, 6 \rangle$  and  $\vec{v} = \langle 1, -1 \rangle$

55. Determine if  $\vec{u} = \langle -6, 3 \rangle$  and  $\vec{v} = \langle \frac{1}{2}, 1 \rangle$  are orthogonal.

56. Find the component of  $\vec{u}$  along  $\vec{v}$  if  $\vec{u} = 7i$  and  $\vec{v} = 8i + 6j$

57. Find the projection of  $\vec{u}$  on  $\vec{v}$  for the vectors  $\vec{u} = \langle 11, 3 \rangle$  and  $\vec{v} = \langle -3, -2 \rangle$

58. Solve the following system:

$$\begin{cases} 4x - 3y = 11 \\ 8x + 4y = 12 \end{cases}$$

59. Graph the solution:

$$\begin{cases} x + y > 12 \\ y < \frac{1}{2}x - 6 \\ 3x + y < 6 \end{cases}$$

60. A man and his daughter manufacture unfinished tables and chairs. Each table requires 3 hours of sawing and 1 hour of assembly. Each chair requires 2 hours of sawing and 2 hours of assembly. The two of them can put in up to 12 hours of sawing and 8 hrs of assembly work each day. Find a system of inequalities that describes all possible combinations of tables and chairs that they can make daily. Graph the solution set.

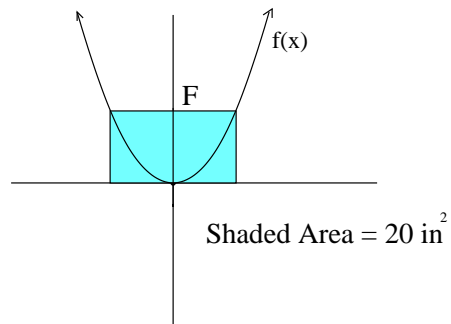
61. Find the equation of the parabola with focus (2,3) and directrix  $y = -1$ .

62. Given  $y^2 - 10y + 8x - 7 = 0$

Find the vertex, focus, and directrix.

63. Write the equation of the parabola with focus (-1,5) and vertex (3,5)

64. Find an equation of the parabola in the figure below:



65. Find the vertices and the foci of the ellipse:

$$4x^2 + 9y^2 = 1$$

66. Write the equation of the ellipse with foci at  $(0, \pm 3)$  and vertices at  $(0, \pm 5)$

67. Write the equation of the ellipse whose foci are (1,4) and (5,4) and with vertices at (0,4) and (6,4).

68. Find the equation of the ellipse whose eccentricity is  $\frac{1}{9}$  and with foci at  $(0, \pm 2)$ .

69. Find the vertices, foci and asymptotes of the hyperbola:  $25y^2 - 9x^2 = 225$ .

70. Find the equation of the hyperbola whose vertices are  $(0, \pm 4)$  which passes through the point  $(3, -5)$ .

71. Find the center and radius of the circle:

$$x^2 + y^2 - 10x + 9 = 0$$

72. Sketch the solution:

$$(x + 1)^2 + (y - 2)^2 \leq 5$$

73. Find the equation of the circle whose diameter is AB where A =  $(6, -3)$  and B =  $(1, 9)$

74. Given:  $f(x) = x^2 - 1$ ,  $g(x) = \frac{x - 1}{x + 2}$ ,

a) find  $(f \circ g)(3)$

b) find  $(g \circ f)(3)$

ANSWERS:

1. Quadrant III

2.  $y = 2x + 8$

3.  $x^2 + y^2 - 16y + 44 = 0$

4.  $C = (-4, 3), r = \sqrt{37}$

5. a. B, b. D, c. G, d. F

6.  $(x - 3)^2 = \frac{8}{3}(y + 4)$

7.  $y = -2x - 2$

8. \$26,733.33

9. 9

10.  $A = -2.5x^2 + 1150x$

11.  $[-3, 11]$

12.  $x \leq 1$  or  $x \geq 3$

13.  $[-3, 3]$

14.  $(-\infty, 1) \cup [2.5, \infty)$

15. 17

16. 2

17. false

18. false

19. false

20. true

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

22.  $(-4, -10)$

23. vertical asymptote:  $x = -1$ ; horizontal asymptote:  $y = 1$ ; hole at  $x = 1$

24.  $\frac{5}{11}$

25. false

26. true

27. true

28. false

29. 12 ounces

30.  $P = \frac{3Q \cdot R}{d^2}$

31. exact:  $x = 36\sqrt{6}$ ; approx 88.18

32. increase of 17 CD/year

33. parabola shifted right  $\alpha$  and up  $\gamma$  and stretched by a factor of  $\beta$

34. zeros at  $-a, b$ ; double root at  $b$

35. 12

36. a)  $\{\pm 1, 2, 5, 10, \frac{1}{2}, \frac{5}{2}, \frac{1}{3}, \frac{2}{3}, \frac{5}{3}, \frac{10}{3}, \frac{1}{6}, \frac{5}{6}\}$

b) 2 or 0 positive real zeros

c) 2 or 0 negative real zeros

d) 3

e) -3

f)  $\frac{2}{3}, \frac{-1}{2}, \sqrt{5}, -\sqrt{5}$

37.  $\frac{-7}{41} - \frac{22}{41}i$

38.  $P(x) = x^3 - 4x^2 + 6x - 4$

39. (1) 400 birds; (2) 22,400 birds

40. \$2,593.46

41.  $\sqrt{3}$

42. -1

43.  $x = .25$

44.  $x < 4$

45. domain  $(0, 1)$

46. domain  $[2, 10)$

47.  $x = 4$

48.  $x = 10^9$

49.  $x = \ln 8$

50.  $x = -\ln 4$

51. phase shift  $\frac{\pi}{2}$  to the right

52.  $\pi$

53.  $\frac{1}{2}$

54.  $\pi$

55. yes, orthogonal

56. 5.6

57.  $\langle 9, 6 \rangle$

58.  $(2, -1)$

59. no solution

60.

61.  $x^2 - 4x - 8y + 12 = 0$

62. vertex  $(4,5)$ , focus  $(2,5)$ , directrix  $x=6$

63.  $y^2 - 10y + 16x - 23 = 0$

64.  $x^2 = 4\sqrt{5}y$

65. vertices  $\left(\pm\frac{1}{2}, 0\right)$ , foci  $\left(\pm\frac{\sqrt{5}}{6}, 0\right)$

66.  $\frac{x^2}{16} + \frac{y^2}{25} = 1$

67.  $\frac{(x-3)^2}{9} + \frac{(y-4)^2}{5} = 1$

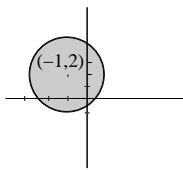
68.  $\frac{x^2}{320} + \frac{y^2}{324} = 1$

69. vertices  $(0, \pm 3)$ , foci  $(0, \pm\sqrt{34})$ ,  
asymptotes  $y = \pm\frac{3}{5}x$

70.  $\frac{y^2}{16} - \frac{x^2}{16} = 1$

71. center  $(5, 0)$ , radius  $r = 4$

72.



73.  $\left(x - \frac{7}{2}\right)^2 + (y - 3)^2 = \left(\frac{13}{2}\right)^2$

74. a)  $\frac{-21}{25}$ , b)  $\frac{7}{10}$