

Math 1110,
College Algebra
Fall 2004
Final Exam

180 points

No calculators. No Notes. Show all work. Place answer in the space given.

1. Find the equation of a line that goes through the points $(-2, 3)$ and $(4, 0)$. Write your answer in slope-intercept form. (3 pts)

Answer: _____

2. Find the equation of a line that is perpendicular to the line $y = \frac{1}{3}x + 2$ that goes through the point $(1, 2)$. Write your answer in slope-intercept form. (3 pts)

Answer: _____

3. Write the equation of the circle with the given radius and center in standard form. (3 pts)

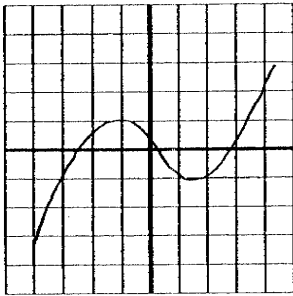
Radius: $\sqrt{2}$

Center: $(-3, 1)$

Answer: _____

4. Determine whether the graph is that of a function, circle yes or no. (1 pt each)

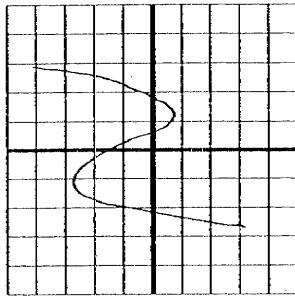
(a)



Yes

No

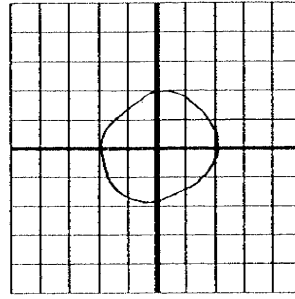
(b)



Yes

No

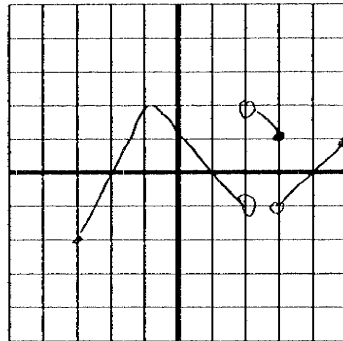
(c)



Yes

No

5. Given the graph of the function below answer the following questions. (2pts each)



(a) List all x -intercepts.

Answer: _____

(b) List the y -intercept.

Answer: _____

(c) Find $f(3)$.

Answer: _____

(d) State the domain of $f(x)$ using interval notation.

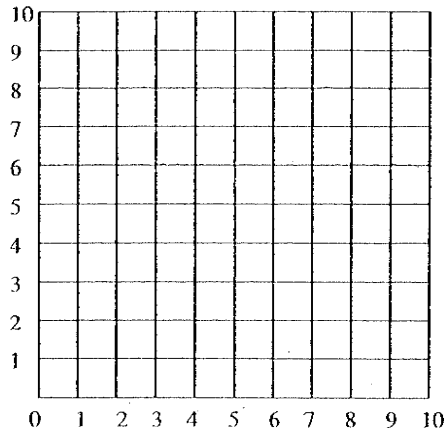
Answer: _____

(e) State the intervals where $f(x)$ is increasing.

Answer: _____

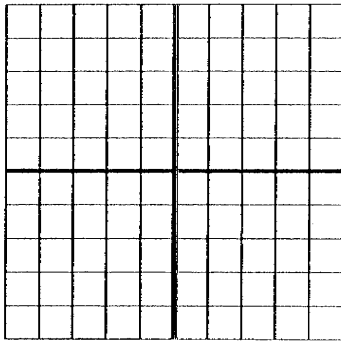
6. Construct a scatterplot of the data in the table below. (3 pts)

x	1	2	4	6	7	9
y	1	2	3	6	5	7

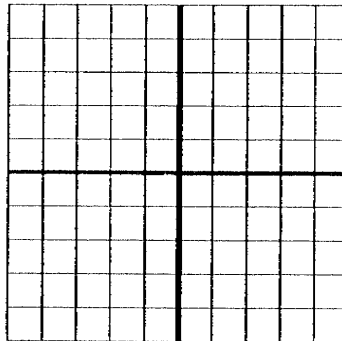


7. Graph the following functions. (6 pts each)

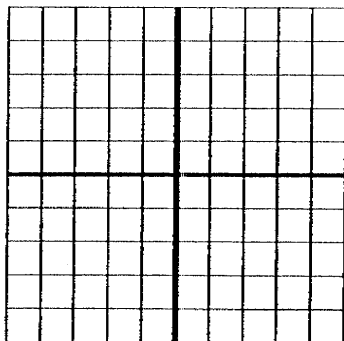
(a) $f(x) = -\sqrt{x-3} + 2$



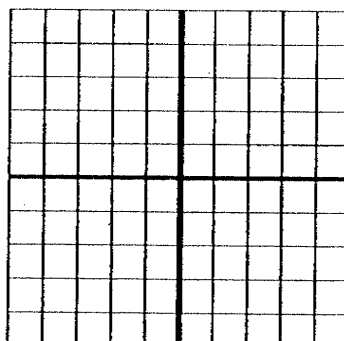
(b) $f(x) = \frac{1}{x+2} - 1$



(c) $f(x) = \begin{cases} x-1 & \text{if } x < -1 \\ 2 & \text{if } -1 \leq x < 1 \\ -x^2 & \text{if } x \geq 1 \end{cases}$



(d) $f(x) = \log_2(x-3)$



8. Use the given quadratic function to answer the following questions.

$$f(x) = -x^2 + 4x$$

(a) Does the parabola open up or down? (1 pt)

Answer: _____

(b) List all x -intercepts of the quadratic function. (3 pts)

Answer: _____

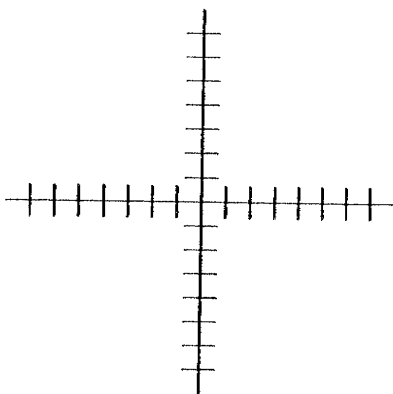
(c) List the y -intercept of the quadratic function. (2 pts)

Answer: _____

(d) Find the vertex of the parabola. (4 pts)

Answer: _____

(e) Sketch the graph of the parabola. (4 pts)



12. Construct a polynomial with the following roots and multiplicities. (4 pts) (leave your answer in factored form)

root	multiplicity
4i	3
-7	1
3	2
0	5

Answer: _____

13. Simplify the following complex expressions into standard $a + bi$ form. (3 pts each)

(a) $\frac{-5 + 2i}{4 - 3i}$

Answer: _____

(b) $2 + i^{133} + 6 - 3i^7$

Answer: _____

14. List all possible rational roots of the following polynomial. (5 pts)

$$f(x) = -15x^5 - 12x^3 + x^2 + x + 6$$

Answer: _____

15. Use the rational function $R(x) = \frac{3x^2 - 12x + 9}{4x^2 + 12x - 16}$ to answer the following questions.

(a) What is the domain of $R(x)$? (4 pts)

Answer: _____

(b) What are the x and y intercepts, if any, of $R(x)$? (4 pts)

x -intercepts: _____

y -intercepts: _____

(c) Find all vertical asymptotes of $R(x)$. (2 pts)

Answer: _____

(d) Find any horizontal or oblique asymptotes, if any. Label any asymptotes as horizontal or oblique. (1 pt)

Answer: _____

16. Use the polynomial $p(x)$ to answer the following questions.

$$p(x) = -3x^3(x+5)^4(x-4)^2(x+3)$$

(a) What are the roots of $p(x)$, and what are their multiplicities? (4 pts)

Answer: _____

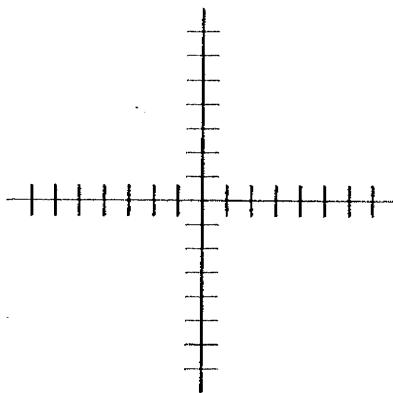
(b) What is the degree of $p(x)$? (1 pt)

Answer: _____

(c) What power function does $p(x)$ act like for large values of $|x|$? (2 pts)

Answer: _____

(d) Graph $p(x)$, and label all x -intercepts. (5 pts)



17. Given that the function $f(x) = 4\sqrt{x} - 1$ is one-to-one, do the following. (3 pts each)

(a) Find $f^{-1}(x)$.

Answer: _____

(b) State the domain and range of f .

Domain: _____

Range: _____

18. Determine if the following statements are true or false. (2 pts each)

(a) $\ln(a) - \ln(b) = \frac{\ln(a)}{\ln(b)}$

Answer: _____

(b) If f and g are inverse functions, then the domain of f is the same as the range of g .

Answer: _____

(c) $a^x a^y = a^{xy}$

Answer: _____

19. Find solutions for the following equations. (3 pts each)

(a) $\ln(e^x) = 5$

Answer: _____

(b) $5(3^{7x}) = 45$

Answer: _____

(c) $5^{2x}5^8 = 25$

Answer: _____

(d) $\log_3(x - 2) + \log_3(x - 4) = 1$

Answer: _____

20. How many years will it take an investment of \$8000 to grow to \$20,000 with an interest rate of 6.5% compounded continuously? Find an exact solution. (3 pts)

Answer: _____

21. Iodine 131 is a radioactive material that decays according to the function

$$A(t) = A_0 e^{-.0067t}$$

where A_0 is the initial amount present and A is the amount present at time t (in days). Assume that a scientist has a sample of 100 grams of iodine 131.

(a) How much iodine 131 is left after 10 days? Find an exact solution. (2 pts)

Answer: _____

(b) When will 20 grams of iodine 131 be left? Find an exact solution. (3 pts)

Answer: _____

22. The logistic growth model $P(t) = \frac{1000}{1 + 24e^{-.43t}}$ represents the population (in grams) of a bacterium after t hours.

(a) What is the carrying capacity of the environment? (1 pt)

Answer: _____

(b) What is the initial population size? (2 pts)

Answer: _____

23. Solve the following system of linear equations. (4 pts)

$$\begin{aligned} 3x - 2y &= 7 \\ -6x + 4y &= 10 \end{aligned}$$

Answer: _____

24. Solve the following system of linear equations. (5 pts)

$$\begin{array}{rcl} x & +2y & = 3 \\ & y & -3z = -1 \\ 2x & +7y & -8z = 5 \end{array}$$

Answer: _____

25. Use the matrices A, B and C below to compute the following matrix equations. (If the equation cannot be computed, state "not possible").

$$A = \begin{bmatrix} 0 & 3 & -5 \\ 1 & 2 & 6 \end{bmatrix}, \quad B = \begin{bmatrix} 3 & -1 \\ 2 & 5 \end{bmatrix}, \quad C = \begin{bmatrix} 0 & 5 \\ -1 & 2 \end{bmatrix}$$

(a) $B+3C$ (3 pts)

Answer: _____

(b) BA (4 pts)

Answer: _____

(c) $A - 2C$ (3 pts)

Answer: _____

26. Find the inverse of the following matrix. (5 pts)

$$\begin{bmatrix} 1 & -1 & 0 \\ 2 & -1 & -1 \\ 0 & 3 & -2 \end{bmatrix}$$

Answer: _____

27. Solve the following system of linear equations using matrix algebra. (5 pts)

$$\begin{aligned} x + 2y &= 4 \\ 2x + 5y &= 6 \end{aligned}$$

Answer: _____