## LOCUST VALLEY HIGH SCHOOL

## MATHEMATICS DEPARTMENT

## PRECALCULUS

## CURRICULUM MAP

## July 2012

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**Textbooks / Learning Resources**

*Advanced Mathematical Concepts*, Gordon, Yunker, Vannatta & Crosswhite, 1994, Glencoe/McGraw-Hill.

ExamView Test Generator, 2008, eInstruction.

**PRECALCULUS**

**Course Overview**

|  |  |
| --- | --- |
| Time Frame | Topic |
| Quarter I | Linear Relations & Functions |
| Systems of Equations & Inequalities |
| The Nature of Graphs |
| Polynomial & Rational Functions |
|  |
| Quarter II | Polynomial & Rational Functions Cont'd |
| Trigonometric Functions |
| Graphs & Inverses of the Trigonometric Functions |
| Trigonometric Identities and Equations |
|  |
| Quarter III | Exponential & Logarithmic Functions |
| Conics |
| Sequences & Series |
|  |
| Quarter IV | Polar Coordinates & Complex Numbers |
| Limits, Derivatives, and Integrals |
| Vectors |
| Review |

**Detailed Course Outline**

|  |  |  |
| --- | --- | --- |
| Chapter | Daily Aim(s) | Suggested Homework |
| 1.1 | Determine whether a given relation is a function | p.10-11 #18-23, 26, 54-57  |
| Identify domain & range of a function |
| Function notation | p.10-11 #40-43, 46, 47, 49, 50, 52, 53  |
| Find values that are not in the domain of a function |
| 1.2 | Operations with functions | p.17 #12-15p.18 #38-40 |
| Composite functions | p.17 #16-21p.18 #32-33, 37 |
| Inverse functions | p.17 # 22-30p.18 #41 |
| **QUIZ** | PSAT/SAT Questions |
| 1.3 | Zeros of linear functions | p. 25-27 #17-19, 31-33, 43, 45, 46, \*47 |
| Graphing linear equations and inequalities |
| 1.5 | Write linear equations using slope-intercept and point-slope forms  | p.40-41 #15-18, 21-23, 33, 37 |
| 1.6 | Equations of parallel & perpendicular lines | p.46-47 #17-19, 23-25, 29, 39, \*40 |
|  | Review |  |
| **EXAM** |
| 2.1 | Solving systems of equations graphically & using the substitution method | p.60-61 #13, 17-19 graphically & by substitution, 33, 34 |
| Solving systems of equations using the elimination method. | p.60-61 #22-27 by elimination, 35, \*37 |
| 2.2 | Operations with matrices (addition, subtraction, multiplication by scalar) | p.68-70 #18-21, 25, 27, 29, 32, 53 |
| Operations with matrices (matrix multiplication) | p.68-70 #33, 35, 37, 39-41, 52, \*54 |
| **QUIZ** | PSAT/SAT Questions |
| 2.3 | Determinants of matrices | p.75-77 #13-18, 37 |
| Inverses of matrices | p.75-77 #19-24, 38 |
| Solve systems of equations by using inverses | p.75-77 #25-28, 39, \*41 |
| 2.4 | Use matrices to solve systems of linear equations | p.82-83 #8-11, 20-21, 24-25 |
| p.82-83 #14-17, 26, 27, \*28 |
| Use matrices to solve systems of linear equations (applications) | p.83 #22-23p. 100 #24-25 |
|  | REVIEW |  |
| **EXAM** | PSAT/SAT Questions |
| 3.1 | Even & odd functions | p.114-116 #26-31, 45, 48, 49, \*51 |
| 3.2 | Transformations of graphs | p.123-124 #13-21 odd, 35-38 |
| 3.3 | Inverse of a function | p.130-131 #13, 19-22, 27, 35, 36, \*37 |
| **QUIZ** | PSAT/SAT Questions |
| 4.1 | Fundamental theorem of algebra | p.182-184 #15-27 odd, 37, 46, \*49  |
| 4.2 | Solving quadratic equations | p.192-193 #15-25 odd, 47, 48 |
| 4.2 | Solving quadratic equations - Additional Practice | Worksheet |
| 9.5 | Simplifying Complex Numbers | p. 499-500 #15, 19, 27, 29, 31, 35, 37, 46, 48 |
|  | REVIEW |  |
| **EXAM** | PSAT/SAT Questions |
| 4.3 | Long division of polynomials | p. 200 #16-19 (use long div.), 21-27 odd, 34, 37 |
| Remainder theorem |
| Synthetic division | p.199-200 #10-15, 29, \*38 |
| 4.4 | Rational root theorem | p.206-207 #11-16, 24, 25 |
| Descartes' rule of signs | p.206-207 #17-24 odd, 36, \*37 |
|  | REVIEW |  |
| **Quarterly I** |
| 3.4 | Determine horizontal, vertical and slant asymptotes | p.140-142 #15-18, 21, 45, 47 |
| 4.6 | Rational equations | p.221-222 #13-20, 40 |
| Partial fraction decomposition | p.221-222 #27-30, 41, \*43 |
| 4.7 | Radical equations and inequalities | p.229 # 9-15 odd, 21, 25, 30, \*33 |
| **QUIZ** | PSAT/SAT Questions |
| 5.1 | Radian and degree measure | p.245-246 #33, 37, 41, 45, 47, 49, 51, 53, 57, 73, 74 |
| Coterminal angles |
| Reference angles |
| 5.2 | Central angles and arcs | p.251-254 #17, 19, 21, 23, 25, 29, 31, 37, 49, 53 |
| Area of a sector |
| 5.5 | Solve right triangles | p.273-275 #15-23 odd, 35, \*39 |
|  | REVIEW |  |
| **EXAM** | PSAT/SAT Questions |
| 5.3 | Finding values of the six trigonometric functions of an angle in standard position given a point on its terminal side | p.260-261 #23, 27, 31, 33, 35, 37, 39, 51, 55 |
| 5.4 | Finding exact values for the six trigonometric functions of special angles | p.267-268 #15-25 odd, 39, 41, 45 |
|  | Working with the unit circle | Worksheet |
| **QUIZ** | PSAT/SAT Questions |
| 5.6 | Law of Sines | p.280-281 #15-23 odd, 27, 33, 34, 35 |
| 5.7 | Law of Cosines | p.286-287 #15-21 odd, 27, 30, 31, 32, \*34 |
| 5.8 | Area of a triangle | p.293-295 #13-17 odd, 21, 23, 27, 38, 40 |
|  | Trigonometric applications | Worksheet |
|  | REVIEW |  |
| **EXAM** | PSAT/SAT Questions |
| 6.1 | Graphs of trigonometric functions | p.305-307 #19, 21, 23, 29-37 odd, 47, 50, 57 |
| 6.2 | Amplitude, period, frequency and phase shift (graphic) | p.315-318 #16-24 even, 37, 40, 42, 44-46 |
| 6.2 | Amplitude, period, frequency and phase shift (algebraic) | p.315-318 #15-23 odd (plus frequency), 27, 32, 51, 55, \*57 |
| **QUIZ** | PSAT/SAT Questions |
| 6.4 | Inverse Trigonometric Functions | p.331-333 #15-27 odd, 41, 52, \*58 |
| 6.5 | Finding principal values of inverse trigonometric functions | p.337-338 #17, 25, 31, 37, 51, \*54p.343-344 #13-23 odd |
| 6.6 | Graphing Inverses of trigonometric functions |
|  | REVIEW |  |
| **EXAM** | PSAT/SAT Questions |
| 7.1 | Trigonometric identities | p.362-363 #23, 27, 35, 37, 41, 43, 47, 49, 61, 63, \*69 |
| 7.2 | Verifying trigonometric identities | p. 367-368 #13, 17, 19, 27, 29, 33, 40, 41 |
| 7.3 | Sum and difference identities | p.375-376 #15, 19, 23, 24, 25, 31, 35, 46, 47, 49 |
| 7.4 | Double and half angle identities | p.381-383 # 17, 21, 22, 23, 25, 31, 33, 37, 46, \*52 |
| **QUIZ** | PSAT/SAT Questions |
| 7.5 | Solving trigonometric equations | p.390-391 #17, 19, 24, 26, 28, 37, 39, 52, 53 |
| 7.5 | Solving trigonometric equations using identities | p.390-391 #21,23, 29, 32, 41, 45, 54, \*56 |
| 7.5 | Solving trigonometric equations - Additional Practice | Worksheet |
|  | REVIEW |  |
| **QUARTERLY II** |
| 10.1 | Standard and general forms of the equation of a circle | p.530-532 #15, 17, 21, 27, 29, 35, 50, 52 |
| 10.2 | Use the standard and general forms of the equation of a parabola | p.540-541 #13, 15, 17, 23, 27, 33, 42, 45, \*46 |
| 10.3 | Use the standard and general forms of the equation of an ellipse | p. 548-550 #15, 17, 19, 23, 27, 29, 31, 33, 50, \*51 |
| 10.4 | Use the standard and general forms of the equation of a hyperbola | p.557-559 #15, 17, 19, 23, 25, 27, 37, 41, 61, \*63 |
| **QUIZ** | PSAT/SAT Questions |
| 10.5 | Identifying conic sections & find the eccentricity | p.566-567 #15, 17, 21-29 odd, 31, 45, \*48 |
| 10.7 | Solving systems of second-degree equations | p.583-854 #17, 19, 23, 26, 27, 36, 40, 43, \*44 |
| 10.8 | Write equations of tangents and normals to conic sections | p.590-591 #15, 17, 19, 23, 29, 31, 35, 45, \*48 |
|  | REVIEW |  |
| **EXAM** | PSAT/SAT Questions |
| 11.1 | Evaluate and simplify expressions containing rational exponents. | p.602-603 #26-29, 37, 41, 43, 50, 51, 59 |
| 11.2 | Graphing exponential equations | p.12-613 #19, 20, 26, 35, 36, 50p.617-619 #25, 27, 33, \*44 |
| 11.3 | Use the compound interest formula to find the amount at the end of an investment |
| 11.4 | Write exponential equation in logarithmic form and vice versa | p.626-628 #19, 21, 25, 27, 41, 45, 46, 63, 66, 74 |
| Solve logarithmic equations by writing them in exponential form |
| 11.4 | Re-write logarithmic expressions using properties of logarithms | Worksheet |
| 11.4 | Solve logarithmic equations using properties of logarithms | p.626-628 #23, 29, 43, 47, 49, 51, 53, 73, \*75 |
| **QUIZ** | PSAT/SAT Questions |
| 11.6 | Solve exponential equations using logarithms | p.639-640 #17, 19, 21, 23, 25, 27, 35, 48, \*52 |
| Solve logarithmic equations using the change of base formula |
| 11.7 | Solve equations using natural logarithms | p.643 #25, 27, 29, 31, 35, 41, 42, 48, \*49 |
| Real life problem solving using the exponential growth formula |
|  | Solving exponential & logarithmic functions - Additional Practice | Worksheet |
|  | REVIEW |  |
| **EXAM** | PSAT/SAT Questions |
| 12.1 | Find the *nth* term of an arithmetic sequence. | p.661-662 #19-31 odd, 48, 49 |
| Use the sum formula for an arithmetic series to find the sum, *n*, or the *nth* term | p.661-662 #33, 35-39, 41, 43, 50, \*51 |
| 12.2 | Find the *nth* term of a geometric sequence. | p.668-669 #16-22, 36, \*38 |
| Use the sum formula for a geometric series to find the sum, *n*, or the *nth* term | p.668-669 #23-28, 31, 37 |
| **QUIZ** | PSAT/SAT Questions |
| 12.3 | Find the limit of the terms of an infinite sequence | p.677-678 #17-20, 23-25, 45, 46 |
| Find the sum of an infinite geometric series | p.677-678 #32-35p.683-684 #5-9, 33 |
| 12.4 | Determine whether a geometric series is convergent or divergent |
| 12.5 | Express a series in sigma notation | p.688-690 #23, 27, 31, 33, 35, 39, 41, 47, 62, 68, \*69 |
|  | REVIEW |  |
| **EXAM** | PSAT/SAT Questions |
| 12.6 | Use the binomial theorem to expand binomials | p.694-695 #11-23 odd, 31, 33, \*34 |
| 12.8 | Use mathematical induction to prove the validity of formulas | p.704 #13, 15, 17, 19, 21, 24, 25, 27 |
| 12.8 | Use mathematical induction to prove the validity of formulas | Worksheet |
|  | REVIEW |  |
| **QUARTERLY III** |
| 17.1 | Use limit theorems to evaluate the limit of a polynomial function | p.920-922 #25-39 odd, 56, \*61 |
| 17.2 | Find the derivative of a function using the definition | p.928-930 #20-24, 53 |
| 17.2 | Find the derivative of a function using the power formula | p.928-930 #24-28,39, 40, 49 |
| **QUIZ: Chapter 17** | PSAT/SAT Questions |
| 17.2 | Find the derivative of a function using the product rule | p.928-930 #12, 13, 29-32, 41, \*56 |
| 17.2 | Find the derivative of a function using the quotient rule | p.928-930 #17, 18, 19, 34, 36, 42, 55 |
| 17.2 | Find the derivative of a function using the chain rule (and mixed operations) | p.928-930 #14, 15, 16, 33, 35, 37, 38, 45 |
|  | REVIEW |  |
| **EXAM** | PSAT/SAT Questions |
| 3.6 | Find the slope and equation of a line tangent to the graph of a function at a given point | p.153-154 #21, 23, 25, 27, 29, 33, 35, 47, \*52 |
| 3.7 | Find the critical points of a graph | p.162-163 #10-17, 37, \*40 |
| 3.7 | Find the critical points of a graph | Worksheet |
| 3.8 | Determine continuity and end behavior of graphs | p.170-171 #15-21 odd, 25, 27, 31,33, 41, \*42 |
| **QUIZ** | PSAT/SAT Questions |
| 17.4 | Introduction to integration | p.943-944 #9-14, 21, 23, 32, \*37 |
| 17.5 | Use the fundamental theorem of calculus to evaluate definite integrals | p.949-950 #23-31, 38, 42 |
| 17.5 | Finding area under a curve | p.949-950 #32-34, 40, 45 |
|  | REVIEW |  |
| **EXAM** | PSAT/SAT Questions |
| 9.1 | Graph simple polar equations | p.470-472 #11, 15, 19, 25, 27, 29, 33, 37, 44, \*46 |
| 9.2 | Graph polar equations | p.480-481 #7-19 odd, 31, \*34 |
| 9.3 | Convert from polar to rectangle coordinates and vice versa | p.486-487 #15, 19, 21, 23, 27-33 odd, 44 |
| 9.6 | Change complex numbers from rectangular to polar form and vice versa | p.504-505 #15, 17, 19, 25, 27, 29, 38, \*42 |
|  | REVIEW |  |
| **QUIZ** | PSAT/SAT Questions |
| 8.1 | Add and subtract vectors geometrically | p.471-418 #16-28 even, 40 |
| 8.1 | Find equal, opposite, and parallel vectors | p.471-418 #30-34 even, 35, 37, 39, 41, \*45 |
| 8.2 | Find ordered pairs that represent vectors | p.423-424 #24-34 even, 41, 42, 43, 44 \*49 |
| Add, subtract, multiply, and find magnitude of vectors algebraically |
|  | REVIEW |  |
| **EXAM** | PSAT/SAT Questions |
| 8.3 | Find the magnitude of vectors in three-dimensional space | p.428-429 #15, 17, 21, 23, 27, 31, 35, 37, 39, \*44 |
| 8.4 | Perpendicular vectors and inner product | p.433-435 #16-21, 32, 40, \*45 |
| 8.4 | Perpendicular vectors and cross product | p.433-435 #22-31, 33, 39, 42 |
| **QUIZ** | PSAT/SAT Questions |
| 8.5 | Applications with vectors | p.439-441 #10, 13 16, 17, 19, 20, 25, 37, \*38 |
| 8.5 | Applications with vectors | Worksheet |
|  | REVIEW |  |
|  | REVIEW |  |
| **QUARTERLY IV** |

Note: One SAT question will be given every Friday and after every Quiz/Exam (in addition to the sample SAT questions given for homework from their textbook).

 ***\*  College Entrance Exam/SAT Question***

Name: Date: Class:

**Precalculus Quarterly I**

**Multiple Choice (2 points each)**

*Identify the choice that best completes the statement or answers the question.*

**Use the Quadratic Formula to solve the equation.**

\_\_\_\_ 1. 

|  |  |  |  |
| --- | --- | --- | --- |
| a. |   | c. |   |
| b. |   | d. |   |

\_\_\_\_ 2. Find an equation for the linethrough (–4, 6) and parallel to *y* = *x* + 4.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a. | *y* = *x*  | b. | *y* = *x*  | c. | *y* = *x*  | d. | *y* = *x*  |

\_\_\_\_ 3. What is the slope of a line perpendicular to the line whose equation is ?

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 4. **Solve the problem.**

Which of the following polynomial functions might have the graph shown in the illustration below?

 ****

|  |  |  |  |
| --- | --- | --- | --- |
| a. | f(x) = x(x - 2)2(x - 1) | c. | f(x) = x(x - 2)(x - 1)2 |
| b. | f(x) = x2(x - 2)2(x - 1)2 | d. | f(x) = x2(x - 2)(x - 1) |

\_\_\_\_ 5. **Determine algebraically whether the function is even, odd, or neither.**

f(x) = -2x4 - x2

|  |  |  |  |
| --- | --- | --- | --- |
| a. | neither | c. | odd |
| b. | even |

\_\_\_\_ 6. **Determine whether the graph is that of a function. If it is, use the graph to find its domain and range, the intercepts, if any, and any symmetry with respect to the x-axis, the y-axis, or the origin.**



|  |  |  |  |
| --- | --- | --- | --- |
| a. | not a function | c. | functiondomain: all real numbersrange: all real numbersintercepts: (-2, 0), (0, 2), (2, 0)symmetry: none |
| b. | functiondomain: {x|x  0}range: {y|y  -2}intercepts: (-2, 0), (0, 2), (2, 0)symmetry: y-axis | d. | functiondomain: {x|x  -2}range: {y|y  0}intercepts: (-2, 0), (0, 2), (2, 0)symmetry: none |

\_\_\_\_ 7. Find the function that is finally graphed after the following transformations are applied to the graph of  The graph is shifted right 3 units, stretched by a factor of 3, shifted vertically down 2 units, and finally reflected across the x-axis.

|  |  |  |  |
| --- | --- | --- | --- |
| a. | y = -3|x - 3| - 2 | c. | y = 3|-x - 3| - 2 |
| b. | y = -(3|x - 3| - 2)  | d. | y = -(3|x + 3| - 2) |

\_\_\_\_ 8. Let  and . Find *f*(*x*) – *g*(*x*).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a. | 2*x* – 5 | b. | 2*x* + 5 | c. | 4*x* – 1 | d. | 2*x* – 1 |

\_\_\_\_ 9. Find .



|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 10. If  and , which expression is equivalent to ?

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 11. Find the inverse of **.

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 12. A rental car agency charges a flat fee of $32.00 plus $3.00 per day to rent a certain car. Another agency charges a fee of $30.50 plus $3.25 per day to rent the same car.

|  |  |
| --- | --- |
| **a.** | Write a system of equations to represent the cost *c* for renting a car at each agency for *d* days. |
| **b.** | Using a graphing calculator, find the number of days for which the costs are the same. Round your answer to the nearest whole day. |

|  |  |  |  |
| --- | --- | --- | --- |
| a. | **a.** **b.** 11 | c. | **a.** **b.** 6 |
| b. | **a.** **b.** 6 | d. | **a.** **b.** 11 |

**Part II (4 points each)**

*Show all work for full credit. A correct answer with no work will receive zero credit.*

 13. (a) Write down the inverse of the matrix ***A*** = 

(b) Solve the simultaneous equations

*x* – 3*y* + *z* = 1

2*x* + 2*y* – *z* = 2

*x* – 5*y* + 3*z* = 3

 14. Find the rational roots of . Explain the process you use and show your work.

 15. Let , *x* and *g* (*x*) = , *x*  .

(a) Find 

(b) Find 

(c) Write down the domain of 

Name: Date: Class:

**Precalculus Quarterly II**

**Multiple Choice (2pts. each)**

*Identify the choice that best completes the statement or answers the question.*

\_\_\_\_ 1. Find the equation for the line through (2, 6) and perpendicular to *y* = *x* + 1.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a. | *y* = *x*  | b. | *y* = *x*  | c. | *y* = *x*  | d. | *y* = *x*  |

\_\_\_\_ 2. –6 – 

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 3. Write the equation that is the translation of  left 1 unit and up 2 units.

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 4. Determine which binomial is a factor of .

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a. | *x* + 5 | b. | *x* + 20 | c. | *x* – 24 | d. | *x* – 5 |

\_\_\_\_ 5. **Find the domain of the function.**

h(x) = 

|  |  |  |  |
| --- | --- | --- | --- |
| a. | {x|x  -4, 0, 4} | c. | {x|x  0} |
| b. | all real numbers | d. | {x|x  4} |

\_\_\_\_ 6. **Solve the problem.**

If f(x) = 6x2 - 5x and g(x) = 2x + 3, solve f(x)  g(x).

|  |  |  |  |
| --- | --- | --- | --- |
| a. | ;  | c. | ;  |
| b. | ;  | d. | ;   |

**Simplify the trigonometric expression.**

\_\_\_\_ 7. 

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a. |  | b. |  | c. |  | d. |  |

\_\_\_\_ 8. **Find the exact value of the indicated trigonometric function of** **.**

csc  = - ,  in quadrant III Find cot .

|  |  |  |  |
| --- | --- | --- | --- |
| a. | -  | c. | -  |
| b. |  | d. | -  |

\_\_\_\_ 9. In , *g* = 8 ft, *h* = 13 ft, and  = 72°. Find . Round your answer to the nearest tenth.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a. | 26.2° | b. | 35.9° | c. | 72.1° | d. | 32.5° |

\_\_\_\_ 10. **Find the domain of the function f and of its inverse function f-1**.

f(x) = 5 sin x - 7

|  |  |
| --- | --- |
| a. | Domain of f: [2, 12]Domain of f-1: [-12, -2] |
| b. | Domain of f: (-, )Domain of f-1: [-12, -2] |
| c. | Domain of f: (-, )Domain of f-1: [2, 12] |
| d. | Domain of f: (-, )Domain of f-1: (-, ) |

\_\_\_\_ 11. **If A denotes the area of the sector of a circle of radius r formed by the central angle** **, find the missing quantity. If necessary, round the answer to two decimal places.**

 =  radians, A = 62 square meters, r = ?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 16.23 m | c. | 64.93 m |
| b. | 15.39 m | d. | 4.03 m |

**Write a cosine function for the graph.**

\_\_\_\_ 12. 

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 13. **Match the graph to its equation.**



|  |  |  |  |
| --- | --- | --- | --- |
| a. |  +  = 1 | c. | -  +  = 1 |
| b. |  +  = 1 | d. |  -  = 1 |

**Identify the conic section. If it is a parabola, give the vertex. If it is a circle, give the center and radius. If it is an ellipse or a hyperbola, give the center and foci.**

\_\_\_\_ 14. 

|  |  |  |  |
| --- | --- | --- | --- |
| a. | circle; center (–4, 2); radius = 9 | c. | circle; center (–4, 2); radius = 3 |
| b. | circle; center (4, –2); radius = 9 | d. | circle; center (4, –2); radius = 3 |

**Part II (4 points each)**

*Show all work for full credit. A correct answer with no work will receive zero credit.*

 15. Find all possible asymptotes for the equation y = . Show all work and label each asymptote.

.

 16. Find the Partial Fraction Decomposition of the following rational expression.



.

 17. A water wheel rotates through the angle θ, the water level L behind the wheel changes according to the equation

 $L=1-sinθ-2cos^{2}θ$

where L is measured in inches. Determine the values of θ for which the water level is zero. Find the **exact** values.

Name: Date: Class:

**Precalculus Quarterly III**

**Multiple Choice (2pts. each)**

*Identify the choice that best completes the statement or answers the question.*

\_\_\_\_ 1. Find the sum of the geometric series.

 –    –  

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. | 2002 |

\_\_\_\_ 2. Find all solutions for the triangle with . If no solutions exist, write *none*. Round to the nearest tenth.



|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. | none |

\_\_\_\_ 3. What are the values of ** in the interval  that satisfy the equation ?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 60º, 240º | c. | 72º, 108º, 252º, 288º |
| b. | 72º, 252º | d. | 60º, 120º, 240º, 300º |

\_\_\_\_ 4. What is the formula for the *n*th term of the sequence ?

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 5. What is the fifteenth term of the sequence ?

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. | 81,920 |
| b. |  | d. | 327,680 |

\_\_\_\_ 6. An auditorium has 21 rows of seats. The first row has 18 seats, and each succeeding row has two more seats than the previous row. How many seats are in the auditorium?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 540 | c. | 760 |
| b. | 567 | d. | 798 |

\_\_\_\_ 7. Given  and , find  and 

|  |  |  |  |
| --- | --- | --- | --- |
| a. | ,  | c. |  ,  |
| b. | ,  | d. | ,  |

\_\_\_\_ 8. Find the annual percent increase or decrease that  models.

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 230% increase | c. | 30% decrease |
| b. | 130% increase | d. | 65% decrease |

**Write the expression as a single natural logarithm.**

\_\_\_\_ 9. 

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a. |  | b. |  | c. |  | d. |  |

\_\_\_\_ 10. **Solve the equation.**

 log2(x + 6) = log8(3x)

|  |  |  |  |
| --- | --- | --- | --- |
| a. | {3} | c. | {9} |
| b. | {3, 0} | d. |  |

\_\_\_\_ 11. **Find the sum of the sequence.**



|  |  |  |  |
| --- | --- | --- | --- |
| a. | 137 | c. | 150 |
| b. | 54 | d. | 92 |

\_\_\_\_ 12. **Use the Binomial Theorem to find the indicated coefficient or term.**

The coefficient of x in the expansion of (4x + 6)3

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 36 | c. | 432 |
| b. | 288 | d. | 864 |

**Find the values of the variables.**

\_\_\_\_ 13. 

|  |  |  |  |
| --- | --- | --- | --- |
| a. | *x* = 2, *y* = 4 | c. | *x* = 4, *y* = 2 |
| b. | *x* = –1, *y* = 3 | d. | *x* = 3, *y* = –1 |

\_\_\_\_ 14. **Find an equation for the hyperbola described.**

Center at (7, 8); focus at (3, 8); vertex at (6, 8)

|  |  |  |  |
| --- | --- | --- | --- |
| a. | (x - 8)2 -  = 1 | c. |  - (y - 7)2 = 1  |
| b. | (x - 7)2 -  = 1 | d. |  - (y - 8)2 = 1  |

**Part II (4 points each)**

*Show all work for full credit. A correct answer with no work will receive zero credit.*

 15. Given the arithmetic sequence 10, 14, 18, 22, 26...

a. Find the sum of the first 17 terms.

b. Write a recursive formula for the sequence.

c. Write an explicit formula for the sequence.

d. Write an expression representing the sum of the sequence using Sigma Notation.

 16. Suppose you invest $580 at 10% compounded continuously.

a. Write an exponential function to model the amount in your investment account.

b. Explain what each value in the function model represents.

c. In how many years will the total reach $3600? Show your work.

 17. Use the Principle of Mathematical Induction to show that the statement is true for all natural numbers n.

6 + 12 + 18 + ... + 6n = 3n(n + 1)

Name: Date: Class:

**Precalculus Quarterly III**

**Multiple Choice (2pts. each)**

*Identify the choice that best completes the statement or answers the question.*

*For which interval(s) is the function increasing and decreasing?*

\_\_\_\_ 1. 

|  |  |
| --- | --- |
| a. | increasing for *x* > 3; decreasing for *x* < 3 |
| b. | increasing for *x* > 8; decreasing for *x* < 8 |
| c. | increasing for *x* > 2; decreasing for *x* < 2 |
| d. | increasing for *x* > 4; decreasing for *x* < 4 |

\_\_\_\_ 2. What is the domain of the function ?

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 3. If  and , what is the value of ?

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. | 3 |
| b. | 3.5 | d. | 6 |

\_\_\_\_ 4. **Determine algebraically whether the function is even, odd, or neither.**



|  |  |  |  |
| --- | --- | --- | --- |
| a. | even | c. | neither |
| b. | odd | d. | both |

\_\_\_\_ 5. Which function is *not* one-to-one?

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 6. Factored completely, the expression  is equivalent to

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 7. The value of the expression  is

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 12 | c. | 24 |
| b. | 22 | d. | 26 |

\_\_\_\_ 8. The equation  is equivalent to

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 9. Find cos ** if ** is an angle in standard position and the point with coordinates (–12, 5) lies on the terminal side of the angle.

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 10. What are the values of ** in the interval  that satisfy the equation ?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 60º, 240º | c. | 72º, 108º, 252º, 288º |
| b. | 72º, 252º | d. | 60º, 120º, 240º, 300º |

\_\_\_\_ 11. What is the formula for the *n*th term of the sequence ?

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 12. Find an equation of the line perpendicular to the graph of  that passes through the point at 

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 13. **Find and simplify the difference quotient of f, , for the function.**

f(x) = 

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |   | d. | 0 |

\_\_\_\_ 14. A circle has a radius of 4 inches. In inches, what is the length of the arc intercepted by a central angle of 2 radians?

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. | 2 | d. | 8 |

\_\_\_\_ 15. Which equation represents the function shown in the accompanying graph?



|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 16. In the diagram below of right triangle *KTW*, , , and .



What is the measure of , to the *nearest minute*?

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 17. The expression  is equivalent to

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 18. Which equation is represented by the accompanying graph?



|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 19. Which statement about the graph of the equation ** is *not* true?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | The domain is the set of all real numbers. | c. | It passes through the point (*e*,1). |
| b. | It is asymptotic to the *x*-axis. | d. | It lies in Quadrants I and II. |

\_\_\_\_ 20. **Find the limit algebraically.**



|  |  |  |  |
| --- | --- | --- | --- |
| a. | -8 | c. | Does not exist |
| b. | -4 | d. | 1 |

\_\_\_\_ 21. **Find the numbers at which f is continuous. At which numbers is f discontinuous?**

f(x) = 

|  |  |
| --- | --- |
| a. | continuous for all real numbers except x = 0, x = 5 |
| b. | continuous for all real numbers except x = 6, x = 5 |
| c. | continuous for all real numbers except x = 5 |
| d. | continuous for all real numbers |

\_\_\_\_ 22. **Find the slope of the tangent line to the graph at the given point.**

f(x) = x2 + 5x at (4, 20)

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 3 | c. | 21 |
| b. | 13 | d. | 9 |

\_\_\_\_ 23. **Find the derivative of the function at the given value of x.**

f(x) = x3 + 4x; x = -2

|  |  |  |  |
| --- | --- | --- | --- |
| a. | -2 | c. | 12 |
| b. | 4 | d. | 16 |

\_\_\_\_ 24. **The letters x and y represent rectangular coordinates. Write the equation using polar coordinates (r,** **).**

x2 + 4y2 = 4

|  |  |  |  |
| --- | --- | --- | --- |
| a. | cos2  + 4 sin2  = 4r | c. | r2(4 cos2  + sin2 ) = 4 |
| b. | 4 cos2  + sin2  = 4r | d. | r2(cos2  + 4 sin2 ) = 4 |

\_\_\_\_ 25. **Write the complex number in rectangular form.**

3

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  + i | c. |  + i |
| b. |  + i | d. |  + i |

**Part II**

*Show all work for full credit.* *A correct answer with no work will receive zero credit.* [4pts. each]

 26. The number of houses in Central Village, New York, grows every year according to the function , where *H* represents the number of houses, and *t* represents the number of years since January 1995. A civil engineering firm has suggested that a new, larger well must be built by the village to supply its water when the number of houses exceeds 1,000. During which year will this first happen?

 27. Solve algebraically for all values of  in the interval .



Express your answers to the *nearest degree*.

 28. Find the derivative of each function.

 a. 

 b. 

 c. 

 d. 

**Part III**

*Show all work for full credit.* *A correct answer with no work will receive zero credit.* [6pts. each]

 29. The diagram below shows the plans for the Locust Valley extension. Since the perimeter of this section of building is covered with poison ivy, the height of the building cannot be measured directly. Given the measurements provided, find the height of the building, to the *nearest foot.* [6pts.]



 30. Tasty Bakery sells three kinds of muffins: chocolate chip muffins for $0.65 each, oatmeal muffins for $0.70 each, and blueberry muffins for $0.75 cents each. Charles buys some of each kind and chooses three more chocolate chip muffins than blueberry muffins. [9pts.]

a) If he spends $6.85 on 10 muffins, how many of each type of muffin does he buy?

 Write and solve a system of three equations in three variables. Show your work.

b) Given the following Matrices,

  , 

 Find:

 i) B + C

 ii) 2A

 iii) 

 iv) C-1 if it exists.

 31. Consider the function *f* (*x*) = 2*x*3 – 3*x*2 – 12*x* + 5.

(a) (i) Find *f* ' (*x*).

(ii) Find the gradient of the curve *f* (*x*) when *x* = 3.

(b) Find the *x*-coordinates of the points on the curve where the gradient is equal to –12.

(c) (i) Calculate the *x*-coordinates of the local maximum and minimum points.

(ii) Hence find the coordinates of the local minimum.