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**The ONLY Math courses with Summer Assignments are:**

- ✓ Honors Algebra 2
- ✓ Honors Precalculus
- ✓ AP Calculus AB

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**There are NO Math Summer Assignments in:**

Algebra 1 Concepts	Algebra 2 Concepts	AP Statistics
Algebra 1	Algebra 2	Intro to Calculus
Geometry Concepts	Algebra 3	AP Calc BC
Geometry	Precalculus	
Honors Geometry	College Prep Algebra	

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**Please contact Ruth Hartcorn, Department Chair, with any questions: [rhartcorn@aacsonline.org](mailto:rhartcorn@aacsonline.org)**

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# Summer Assignment

## For Students Entering Honors Algebra 2

Greetings! The US Math Department would like to welcome you to your next math course. It is vital that you retain your math foundation from the prerequisite courses you have taken throughout the summer. Therefore, we request you spend time over the summer reviewing and completing the Entry Level Assessment.

Please keep in mind that this is an honors level course and, as such, you will be expected to show initiative in learning as you review this summer and while taking the course next year. Consequently you must take step 5 below seriously.

1. Purchase the REQUIRED online access, through Edtech, using your AACCS STUDENT EMAIL. The online access includes a digital ebook. If you would like (this is *optional*), you may also purchase a *hard copy* of the textbook (*Algebra 2 Common Core*, ISBN number 9780133186024) via Edtech or a vendor of your choice. Do so early enough in the summer so that you can take the “Entry Level Assessment” (see #4 below).
2. During the summer, please organize your notes from Algebra 1 and Geometry. You may find it helpful to refer to these notes at various times throughout the course next year, and it is important that they are accessible to you in an organized manner. You will be adding to your notes through your next course to ensure a good foundation for future math courses either here at AACCS or in college.
3. Prepare for the “Entry Level Assessment” by reviewing your notes or your old textbooks.
4. Take the Entry Level Assessment (p. xxxvi-xxxviii) in one sitting. You will need approximately 30-60 minutes to finish it. Please do not make blind guesses on the answers. It would be better for both of us if you don't get an answer correct if you don't know the concept. NOTE: a pdf file of the Entry Level Assessment is included online under Summer Assignments, Upper School (listed along with this document).
5. After you've answered all of the questions, go back with your notes or books and try to answer those that you couldn't do the first time. (This can be done at a later date.) For additional help you may find [khanacademy.com](http://khanacademy.com) and [purplemath.com](http://purplemath.com) helpful in learning or re-learning topics. Please note that you are accountable for all of the topics on the Entry Level Assessment even if you don't remember how to do them. You may find, therefore, that your summer work will take you longer than some of your classmates.
6. Prior to the first day of school, get oriented to the textbook by reading pages viii-xv.

THE PURPOSE OF THIS SUMMER ASSIGNMENT IS NOT TO CHECK SOMETHING OFF YOUR TO-DO LIST. IT IS TO **SPEND AMPLE TIME REVIEWING BASIC ALGEBRA CONCEPTS TO ENSURE YOUR SUCCESS IN HONORS ALGEBRA 2.**

I wish you a wonderful summer vacation and appreciate your efforts in preparing for a positive start for the 2018-2019 math school year! I look forward to **receiving your summer work and seeing the results of your efforts on Wednesday, August 22, the first day of school ... make sure to bring it with you!**

Sincerely, Mr. Deterding ([cdeterding@aacsonline.org](mailto:cdeterding@aacsonline.org))

## Summer Assignment

### For Students Entering Honors Precalculus

Best wishes for a fun, relaxing, and safe summer! Your math teachers want to help you maintain math knowledge and skills over the summer break in order to have a successful start in August. So we're assigning work that will review the information that you learned in the last year or two that will support your success in the coming year. In order for this to be *effective*, we recommend you do a portion each week, going back to old notebooks, online sources, or using Chapter 0 in your Precalculus book to help you work through any questions that are posing a problem. WORK at them; "I don't get it" is not the ideal response. All problems must be attempted and all your work must be shown.

If you have any questions, please email your teacher Mrs. McCollum or Mrs. Hartcorn (Math Department Chair):

- [vmccollum@aacsonline.org](mailto:vmccollum@aacsonline.org)
- [rhartcorn@aacsonline.org](mailto:rhartcorn@aacsonline.org)

### Now – THE ASSIGNMENT:

1. Purchase the designated text book ("Precalculus"; ISBN 9780076641833) – hard copy or digital
2. Complete these problems without a calculator (read the lessons and use the examples to help you, as needed):
  - a. p. P8 (1 – 29 odd, 39, 41, 45, 51) – Operations with Complex Numbers
  - b. p. P13 (11-17 odd, 25, 27, 31–37 odd, 43–51 odd) – Quadratic Functions & Equations
  - c. p. P17 (1 – 19 odd, 25, 27) –  $n^{\text{th}}$  Roots and Real Exponents
  - d. p. P22 (3-4, 9-17 odd, 21, 23, 29 – 33 odd, 41, 43, 48) – Systems of Linear Equations and Inequalities
  - e. p. P27 (1-7 odd, 11-13, 23, 25, 27, 31, 34, 40, 43) – Matrix Operations
  - f. p. P31 (1-13 odd, 21, 23, 25, 26) – Probability with Permutations and Combinations **You may use a calculator on all the problems on p. P31.**
3. ALL WORK MUST BE SHOWN – on lined or graph paper. Circle or box your answers.
4. USE A COLORED PEN AND CORRECT YOUR WORK using the Selected Answers beginning on page R29 (the blue pages at the back of the text)
5. BRING THIS TO CLASS on the first day – it will represent your first homework grade and count as one week's worth of homework. It will also help prepare you for the first quiz on Day 3 of your new class.
6. READ the introductory material before the Table of Contents.

*We appreciate your efforts in preparing for your next year of Math!*

## Summer Assignment For Students Entering AP Calculus AB

- I. Purchase your calculus text, Single Variable Calculus with Vector Functions (AP edition), 7<sup>th</sup> ed., James Stewart, ISBN 978-0-8400-4823-3, early in the summer. Please be sure to get this exact edition, as there are several similar versions of this textbook. Please work on the written portion of your summer assignment at a leisurely, not frantic, pace. The assignment is long (get used to it) and you'll need to spread it out over several weeks during the summer. Its intent is twofold: to keep mathematical ideas fresh in your minds and to make sure you know the basics well enough to hit the ground running.
- II. Take the Diagnostic Tests A-D on pages xxiv-xxviii. Show all of your work. After completing each test, check your answers, then find out why you missed any that you got wrong by checking your old textbooks, notes, online resources, other class members, etc.
- III. You will be working through Appendices A-E & G on pages A2-A39 & A46-A52, completing some of the exercises. In many cases I've chosen pairs of questions where odd & even exercises are similar. This way you can check your answers to the odd numbered exercises in the back of the book (beginning on p. A112) before attempting the even numbered exercises that I will be spot checking to evaluate your understanding of the material (and perhaps preparing remedial lessons if there are many students who have difficulty with particular concepts). Complete the following exercises from the text. If you have trouble with the exercises, please call someone else who is going to be in the class, and try to work them out together.

<u>Section</u>	<u>Assignment</u>
App. A	p. A9-A10 9, 10, 19, 20, 23, 24, 27, 28, 35-38, 45, 46, 49, 50, 55, 56, 63, 65, 67, 69, 70
App. B	p. A15-A16 7, 8, 11, 12, 25, 27, 33, 36, 41, 53, 54, 56, 58, 59, 62
App. C	p. A23 1, 2, 5, 6, 27, 29, 30, 33, 34
App. D	p. A32-A33 1, 2, 7, 8, 13, 14, 17-20, 23-36, 42, 43, 46, 47, 52, 59, 60, 63-65, 69, 70, 77, 78, 82, 88
App. E	p. A38 3-6, 13, 14, 19, 21, 22, 31, 32
App. G	p. A51-52 19-22, 27, 37

- IV. Read "Principles of Problem Solving" on pages 97-99 (example 1 only).
- V. Read "To the Student" on pages xxii-xxiii to become oriented to conventions that the author uses in the text.
- VI. Read "A Preview of Calculus" on pages 1-8.
- VII. Read section 1.1, then re-read it before the first lecture (2<sup>nd</sup> day of school). I will be asking you throughout the course to pre-read sections before I lecture on them. The purpose of these readings is to expose you to the concepts & vocabulary, certainly not for you to teach yourself the concepts!
- VIII. Study for the pretest, to be taken on the first day of school. It will cover the above material as well as other topics listed on the other side of this sheet. The test will count as your first major grade. Note that Reference Pages 1-4 at the back of the textbook contain useful formulae from algebra, geometry and trigonometry.
- IX. Make sure you are very familiar with using your graphing calculator. (Yes they do come with manuals.)
- X. Please take this summer assignment very seriously. It will count as a major homework assignment. To help you to pace yourself, I am asking that you mail (or hand deliver) portions of the assignment to the school (109 Burns Crossing Rd, Severn, MD 21144) or scan them and then email them to me ([cdeterding@aacsonline.org](mailto:cdeterding@aacsonline.org)) by the following **deadlines**. If you scan your work, please send it to me as one file, not one file for each page. Please do NOT send me pictures of the pages, since pencil writing may be difficult to read.

Appendix A-B **July 2**

Appendix C-D **August 3**

Appendix E & G **August 22 (first day of school)**

Points will be deducted for assignments received after the due dates.

## AP CALCULUS PREPARATION

The following topics and skills are considered to be a bare minimum for success in Calculus. You should be well versed in all of the topics from geometry, algebra 2, and precalculus, but especially with the following. We will have a test on the following material on the first day of school.

### Geometry

Areas/Surface Areas – circles, cylinder, sphere, cone, prism

Volumes – sphere, cylinder, cone, prism, pyramid

### Algebra

Functional notation

Definition of logarithms

Laws of logarithms

Absolute value

Quadratic formula

Completing the square, e.g.,  $f(x) = 3 + 2x - x^2$

$g(x) = 4x^2 + 4x + 2$

Inequalities, e.g.,  $x^2 - x - 6 \geq 0$

$x^3 + 2x^2 - 3x < 0$

Distance formula

Fractional exponents

Factoring, including sum and difference of cubes

Slopes of lines; parallel and perpendicular lines

Point-slope & slope-intercept forms of straight lines

Parabolas

Graphs of conics

Complex fractions

Polynomial/ Synthetic division

Translations and dilations, e.g., given  $f(x)$ , find  $f(x-a)$ ,  $f(x) + b$ ,  $f(ax)$ ,  $a f(x)$ , and combinations thereof.

### Trigonometry

Radian measure (we do not use degree measure in calculus)

Law of cosines

All six functions of angles that are multiples of  $\pi/2$ ,  $\pi/3$ ,  $\pi/4$  &  $\pi/6$

Triangle definitions of trig functions

Inverse trig functions – definitions & range values

You must know the following identities, not simply how to look them up and use them:

$$\sec x = \frac{1}{\cos x}$$

$$\csc x = \frac{1}{\sin x}$$

$$\cot x = \frac{1}{\tan x}$$

$$\sin^2 x + \cos^2 x = 1$$

$$\sec^2 x - \tan^2 x = 1$$

$$\sec^2 x - 1 = \tan^2 x$$

$$\tan^2 x + 1 = \sec^2 x$$

$$\sin 2x = 2 \sin x \cos x$$

$$\cos 2x = \cos^2 x - \sin^2 x, \text{ and its equivalent forms}$$

$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

$$\sin(-x) = -\sin x$$

$$\cos(-x) = \cos x$$

$$y = r \sin \theta$$

$$x = r \cos \theta$$



# Diagnostic Tests

Success in calculus depends to a large extent on knowledge of the mathematics that precedes calculus: algebra, analytic geometry, functions, and trigonometry. The following tests are intended to diagnose weaknesses that you might have in these areas. After taking each test you can check your answers against the given answers and, if necessary, refresh your skills by referring to the review materials that are provided.

## A Diagnostic Test: Algebra

1. Evaluate each expression without using a calculator.

- (a)  $(-3)^4$  (b)  $-3^4$  (c)  $3^{-4}$   
(d)  $\frac{5^{23}}{5^{21}}$  (e)  $\left(\frac{2}{3}\right)^{-2}$  (f)  $16^{-3/4}$

2. Simplify each expression. Write your answer without negative exponents.

- (a)  $\sqrt{200} - \sqrt{32}$   
(b)  $(3a^3b^3)(4ab^2)^2$   
(c)  $\left(\frac{3x^{3/2}y^3}{x^2y^{-1/2}}\right)^{-2}$

3. Expand and simplify.

- (a)  $3(x + 6) + 4(2x - 5)$  (b)  $(x + 3)(4x - 5)$   
(c)  $(\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b})$  (d)  $(2x + 3)^2$   
(e)  $(x + 2)^3$

4. Factor each expression.

- (a)  $4x^2 - 25$  (b)  $2x^2 + 5x - 12$   
(c)  $x^3 - 3x^2 - 4x + 12$  (d)  $x^4 + 27x$   
(e)  $3x^{3/2} - 9x^{1/2} + 6x^{-1/2}$  (f)  $x^3y - 4xy$

5. Simplify the rational expression.

- (a)  $\frac{x^2 + 3x + 2}{x^2 - x - 2}$  (b)  $\frac{2x^2 - x - 1}{x^2 - 9} \cdot \frac{x + 3}{2x + 1}$   
(c)  $\frac{x^2}{x^2 - 4} - \frac{x + 1}{x + 2}$  (d)  $\frac{\frac{y}{x} - \frac{x}{y}}{\frac{1}{y} - \frac{1}{x}}$



6. Rationalize the expression and simplify.

(a)  $\frac{\sqrt{10}}{\sqrt{5}-2}$

(b)  $\frac{\sqrt{4+h}-2}{h}$

7. Rewrite by completing the square.

(a)  $x^2 + x + 1$

(b)  $2x^2 - 12x + 11$

8. Solve the equation. (Find only the real solutions.)

(a)  $x + 5 = 14 - \frac{1}{2}x$

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

(c)  $x^2 - x - 12 = 0$

(d)  $2x^2 + 4x + 1 = 0$

(e)  $x^4 - 3x^2 + 2 = 0$

(f)  $3|x-4| = 10$

(g)  $2x(4-x)^{-1/2} - 3\sqrt{4-x} = 0$

9. Solve each inequality. Write your answer using interval notation.

(a)  $-4 < 5 - 3x \leq 17$

(b)  $x^2 < 2x + 8$

(c)  $x(x-1)(x+2) > 0$

(d)  $|x-4| < 3$

(e)  $\frac{2x-3}{x+1} \leq 1$

10. State whether each equation is true or false.

(a)  $(p+q)^2 = p^2 + q^2$

(b)  $\sqrt{ab} = \sqrt{a}\sqrt{b}$

(c)  $\sqrt{a^2+b^2} = a+b$

(d)  $\frac{1+TC}{C} = 1+T$

(e)  $\frac{1}{x-y} = \frac{1}{x} - \frac{1}{y}$

(f)  $\frac{1/x}{a/x-b/x} = \frac{1}{a-b}$

**Answers to Diagnostic Test A: Algebra**

1. (a) 81 (b) -81 (c)  $\frac{1}{81}$   
 (d) 25 (e)  $\frac{9}{4}$  (f)  $\frac{1}{8}$
2. (a)  $6\sqrt{2}$  (b)  $48a^5b^7$  (c)  $\frac{x}{9y^7}$
3. (a)  $11x-2$  (b)  $4x^2+7x-15$   
 (c)  $a-b$  (d)  $4x^2+12x+9$   
 (e)  $x^3+6x^2+12x+8$
4. (a)  $(2x-5)(2x+5)$  (b)  $(2x-3)(x+4)$   
 (c)  $(x-3)(x-2)(x+2)$  (d)  $x(x+3)(x^2-3x+9)$   
 (e)  $3x^{-1/2}(x-1)(x-2)$  (f)  $xy(x-2)(x+2)$
5. (a)  $\frac{x+2}{x-2}$  (b)  $\frac{x-1}{x-3}$   
 (c)  $\frac{1}{x-2}$  (d)  $-(x+y)$
6. (a)  $5\sqrt{2} + 2\sqrt{10}$  (b)  $\frac{1}{\sqrt{4+h}+2}$
7. (a)  $(x+\frac{1}{2})^2 + \frac{3}{4}$  (b)  $2(x-3)^2 - 7$
8. (a) 6 (b) 1 (c) -3, 4  
 (d)  $-1 \pm \frac{1}{2}\sqrt{2}$  (e)  $\pm 1, \pm\sqrt{2}$  (f)  $\frac{2}{3}, \frac{22}{3}$   
 (g)  $\frac{12}{5}$
9. (a)  $[-4, 3)$  (b)  $(-2, 4)$   
 (c)  $(-2, 0) \cup (1, \infty)$  (d)  $(1, 7)$   
 (e)  $(-1, 4]$
10. (a) False (b) True (c) False  
 (d) False (e) False (f) True

If you have had difficulty with these problems, you may wish to consult the Review of Algebra on the website [www.stewartcalculus.com](http://www.stewartcalculus.com)

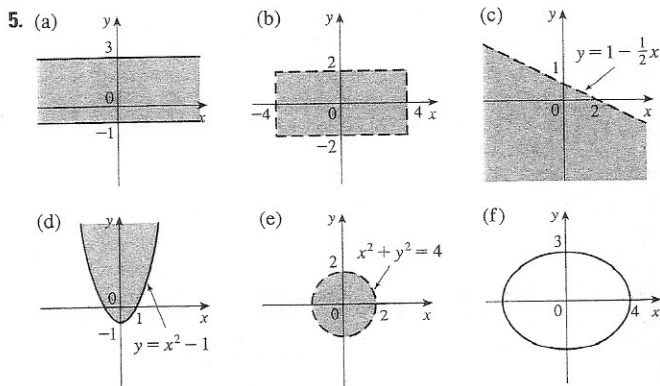


**B Diagnostic Test: Analytic Geometry**

- Find an equation for the line that passes through the point  $(2, -5)$  and
  - has slope  $-3$
  - is parallel to the  $x$ -axis
  - is parallel to the  $y$ -axis
  - is parallel to the line  $2x - 4y = 3$
- Find an equation for the circle that has center  $(-1, 4)$  and passes through the point  $(3, -2)$ .
- Find the center and radius of the circle with equation  $x^2 + y^2 - 6x + 10y + 9 = 0$ .
- Let  $A(-7, 4)$  and  $B(5, -12)$  be points in the plane.
  - Find the slope of the line that contains  $A$  and  $B$ .
  - Find an equation of the line that passes through  $A$  and  $B$ . What are the intercepts?
  - Find the midpoint of the segment  $AB$ .
  - Find the length of the segment  $AB$ .
  - Find an equation of the perpendicular bisector of  $AB$ .
  - Find an equation of the circle for which  $AB$  is a diameter.
- Sketch the region in the  $xy$ -plane defined by the equation or inequalities.
  - $-1 \leq y \leq 3$
  - $|x| < 4$  and  $|y| < 2$
  - $y < 1 - \frac{1}{2}x$
  - $y \geq x^2 - 1$
  - $x^2 + y^2 < 4$
  - $9x^2 + 16y^2 = 144$

**Answers to Diagnostic Test B: Analytic Geometry**

- $y = -3x + 1$
  - $y = -5$
  - $x = 2$
  - $y = \frac{1}{2}x - 6$
- $(x + 1)^2 + (y - 4)^2 = 52$
- Center  $(3, -5)$ , radius 5
- $-\frac{4}{3}$
  - $4x + 3y + 16 = 0$ ;  $x$ -intercept  $-4$ ,  $y$ -intercept  $-\frac{16}{3}$
  - $(-1, -4)$
  - 20
  - $3x - 4y = 13$
  - $(x + 1)^2 + (y + 4)^2 = 100$



If you have had difficulty with these problems, you may wish to consult the review of analytic geometry in Appendixes B and C.



# C Diagnostic Test: Functions

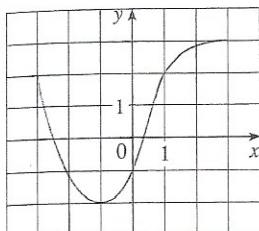


FIGURE FOR PROBLEM 1

- The graph of a function  $f$  is given at the left.
  - State the value of  $f(-1)$ .
  - Estimate the value of  $f(2)$ .
  - For what values of  $x$  is  $f(x) = 2$ ?
  - Estimate the values of  $x$  such that  $f(x) = 0$ .
  - State the domain and range of  $f$ .
- If  $f(x) = x^3$ , evaluate the difference quotient  $\frac{f(2+h) - f(2)}{h}$  and simplify your answer.
- Find the domain of the function.
  - $f(x) = \frac{2x+1}{x^2+x-2}$
  - $g(x) = \frac{\sqrt[3]{x}}{x^2+1}$
  - $h(x) = \sqrt{4-x} + \sqrt{x^2-1}$
- How are graphs of the functions obtained from the graph of  $f$ ?
  - $y = -f(x)$
  - $y = 2f(x) - 1$
  - $y = f(x-3) + 2$
- Without using a calculator, make a rough sketch of the graph.
  - $y = x^3$
  - $y = (x+1)^3$
  - $y = (x-2)^3 + 3$
  - $y = 4 - x^2$
  - $y = \sqrt{x}$
  - $y = 2\sqrt{x}$
  - $y = -2^x$
  - $y = 1 + x^{-1}$
- Let  $f(x) = \begin{cases} 1 - x^2 & \text{if } x \leq 0 \\ 2x + 1 & \text{if } x > 0 \end{cases}$ 
  - Evaluate  $f(-2)$  and  $f(1)$ .
  - Sketch the graph of  $f$ .
- If  $f(x) = x^2 + 2x - 1$  and  $g(x) = 2x - 3$ , find each of the following functions.
  - $f \circ g$
  - $g \circ f$
  - $g \circ g \circ g$

## Answers to Diagnostic Test C: Functions

- (a)  $-2$
  - (b)  $2.8$
  - (c)  $-3, 1$
  - (d)  $-2.5, 0.3$
  - (e)  $[-3, 3], [-2, 3]$
- $12 + 6h + h^2$
- (a)  $(-\infty, -2) \cup (-2, 1) \cup (1, \infty)$
  - (b)  $(-\infty, \infty)$
  - (c)  $(-\infty, -1] \cup [1, 4]$
- (a) Reflect about the  $x$ -axis
  - (b) Stretch vertically by a factor of 2, then shift 1 unit downward
  - (c) Shift 3 units to the right and 2 units upward
- (a)
  - (b)
  - (c)
- (a)  $-3, 3$
  - (b)
- (a)
  - (b)
  - (c)
- (a)  $(f \circ g)(x) = 4x^2 - 8x + 2$
  - (b)  $(g \circ f)(x) = 2x^2 + 4x - 5$
  - (c)  $(g \circ g \circ g)(x) = 8x - 21$

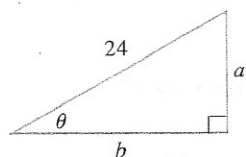
**D Diagnostic Test: Trigonometry**

FIGURE FOR PROBLEM 5

- Convert from degrees to radians.  
(a)  $300^\circ$  (b)  $-18^\circ$
- Convert from radians to degrees.  
(a)  $5\pi/6$  (b) 2
- Find the length of an arc of a circle with radius 12 cm if the arc subtends a central angle of  $30^\circ$ .
- Find the exact values.  
(a)  $\tan(\pi/3)$  (b)  $\sin(7\pi/6)$  (c)  $\sec(5\pi/3)$
- Express the lengths  $a$  and  $b$  in the figure in terms of  $\theta$ .
- If  $\sin x = \frac{1}{3}$  and  $\sec y = \frac{5}{4}$ , where  $x$  and  $y$  lie between 0 and  $\pi/2$ , evaluate  $\sin(x + y)$ .
- Prove the identities.  
(a)  $\tan \theta \sin \theta + \cos \theta = \sec \theta$   
(b)  $\frac{2 \tan x}{1 + \tan^2 x} = \sin 2x$
- Find all values of  $x$  such that  $\sin 2x = \sin x$  and  $0 \leq x \leq 2\pi$ .
- Sketch the graph of the function  $y = 1 + \sin 2x$  without using a calculator.

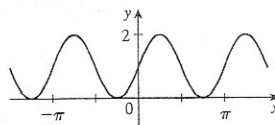
**Answers to Diagnostic Test D: Trigonometry**

- (a)  $5\pi/3$  (b)  $-\pi/10$
- (a)  $150^\circ$  (b)  $360^\circ/\pi \approx 114.6^\circ$
- $2\pi$  cm
- (a)  $\sqrt{3}$  (b)  $-\frac{1}{2}$  (c) 2
- (a)  $24 \sin \theta$  (b)  $24 \cos \theta$

6.  $\frac{1}{13}(4 + 6\sqrt{2})$

8.  $0, \pi/3, \pi, 5\pi/3, 2\pi$

9.



If you have had difficulty with these problems, you should look at Appendix D of this book.