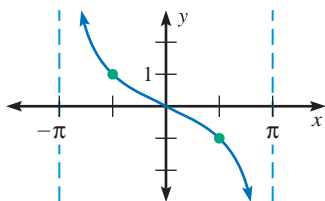


# Chapter Standardized Test

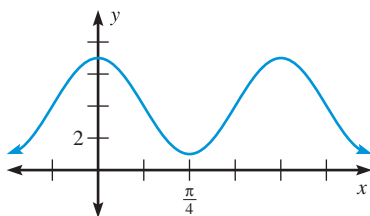
**TEST-TAKING STRATEGY** Long-term preparation for the SAT can be done throughout your high school career and can improve your overall abilities. If you keep up with your homework, both your problem-solving abilities and your vocabulary will improve. This type of long-term preparation will definitely affect not only your SAT scores, but your overall future academic performance as well.

1. **MULTIPLE CHOICE** Which function is graphed?



- (A)  $y = \tan 2x$  (B)  $y = -\tan 2x$   
(C)  $y = \tan \frac{1}{2}x$  (D)  $y = -\tan \frac{1}{2}x$   
(E)  $y = -2 \tan x$

2. **MULTIPLE CHOICE** Which function is graphed?



- (A)  $y = 4 \cos \frac{1}{4}x$  (B)  $y = 3 + 4 \cos \frac{1}{4}x$   
(C)  $y = 3 + 4 \cos 4x$  (D)  $y = 4 \cos 4x$   
(E)  $y = 4 + 3 \cos 4x$

3. **MULTIPLE CHOICE** What is the simplified form of

$$\sin^2\left(\frac{\pi}{2} - x\right) \tan^2 x + \cos^2(-x) + \tan^2 x?$$

- (A)  $\sec^2 x$  (B)  $2 \tan^2 x$  (C)  $\csc^2 x$   
(D)  $1 + \sec^2 x$  (E)  $\sin^2 x + \tan^2 x$

4. **MULTIPLE CHOICE** Which of the following is a solution of the equation  $\tan^2 x \cos x = \cos x$ ?

- (A)  $x = 0$  (B)  $x = \frac{\pi}{6}$  (C)  $x = \frac{\pi}{2}$   
(D)  $x = \frac{5\pi}{6}$  (E)  $x = \frac{5\pi}{4}$

5. **MULTIPLE CHOICE** What is the exact value of  $\tan \frac{5\pi}{12}$ ?

- (A)  $3 - 2\sqrt{3}$  (B)  $2 - \sqrt{3}$  (C)  $\sqrt{3} - 1$   
(D)  $2 + \sqrt{3}$  (E)  $2\sqrt{3} + 3$

6. **MULTIPLE CHOICE** Given that  $\cos \theta = -\frac{3}{5}$  and  $\pi < \theta < \frac{3\pi}{2}$ , which of the following is true?

- (A)  $\tan \theta = \frac{3}{4}$  (B)  $\csc \theta = \frac{5}{4}$   
(C)  $\sec \theta = \frac{5}{3}$  (D)  $\tan \theta = -\frac{4}{3}$   
(E)  $\cot \theta = \frac{3}{4}$

7. **MULTIPLE CHOICE** What trigonometric function has a graph with maximum  $(\pi, 2)$  and minimum  $(3\pi, -2)$ ?

- (A)  $y = 2 \sin 2x$  (B)  $y = 2 \cos 2x$   
(C)  $y = 2 \sin \frac{1}{2}x$  (D)  $y = 2 \cos \frac{1}{2}x$   
(E)  $y = 2 \sin \frac{\pi}{2}x$

8. **MULTIPLE CHOICE** Which of the following is a solution of the equation  $\frac{\tan x \sin 2x + 2 \sin^2 x}{-1 + 4 \sin x} = 1$ ?

- (A)  $x = 0$  (B)  $x = \frac{5\pi}{6}$  (C)  $x = \frac{11\pi}{6}$   
(D)  $x = \pi$  (E) There is no solution.

9. **MULTIPLE CHOICE** What is the simplified form of


$$\frac{2 \sin x \tan \frac{x}{2}}{\cos\left(\frac{\pi}{2} - x\right) \sin(-x) + 1}?$$

- (A)  $\frac{1 - \cos x}{\cos^2 x}$  (B)  $2 \sec^2 x$   
(C)  $\frac{2 - 2 \cos x}{\cos^2 x}$  (D)  $\frac{2}{\cos^2 x}$   
(E)  $\frac{2 \sin x}{\cos^2 x}$


**QUANTITATIVE COMPARISON** In Exercises 10 and 11, choose the statement that is true about the given quantities.

- (A) The quantity in column A is greater.
- (B) The quantity in column B is greater.
- (C) The two quantities are equal.
- (D) The relationship cannot be determined from the given information.

	Column A	Column B
10.	Amplitude of the graph of $y = -5 + 4 \sin 3\pi x$	Amplitude of the graph of $y = 3 - 5 \sin 2\pi x$
11.	Period of the graph of $y = \tan 4\pi x$	Period of the graph of $y = 3 \tan 4x$

12.  **MULTI-STEP PROBLEM** The average daily time  $R$  of the sunrise and the average daily time  $S$  of the sunset for each month in Dallas, Texas, is given in the table. The variable  $t$  is measured in months, with  $t = 0$  representing January 1.

$t$	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5
$R$	7:29	7:10	6:37	5:58	5:29	5:20	5:31	5:51	6:11	6:32	6:58	7:21
$S$	17:45	18:12	18:36	18:58	19:20	19:36	19:35	19:11	18:33	17:54	17:27	17:24

- a. Use a graphing calculator to find trigonometric models for  $R$  and  $S$  as functions of  $t$ . When entering the data into the calculator, you must convert the number of minutes into a fraction of an hour. For example, enter 7:27 as  $7 + (27/60)$ .
  - b. Graph the functions you found in part (a). Use a viewing window of  $0 \leq x \leq 48$  and  $0 \leq y \leq 24$ . Describe the periods, amplitudes, and locations of local maximums and minimums. How are the functions alike? How are they different?
  - c. Let  $D = S - R$ . What does  $D$  represent?
  - d. Graph  $D$  in the same viewing window as  $R$  and  $S$ . How are the maximums and minimums of the three functions related? Explain the real-life significance of the relationships.
13.  **MULTI-STEP PROBLEM** The average number of daylight hours  $D_M$  in Great Falls, Michigan, is given in the table. The variable  $t$  is measured in months, with  $t = 0$  representing January 1.

$t$	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5
$D_M$	8:57	10:18	11:55	13:38	15:07	15:54	15:31	14:14	12:34	10:51	9:21	8:32

- a. Use a calculator to find a trigonometric model for  $D_M$  as a function of  $t$ .
- b. Use the table given in Exercise 12. Subtract each  $R$ -value from its corresponding  $S$ -value to find the average number of hours of sunlight a day for each month in Dallas. Use a graphing calculator to find a trigonometric model for the data as a function of  $t$ .
- c. Graph the functions you found in parts (a) and (b). Use a viewing window of  $0 \leq x \leq 48$  and  $0 \leq y \leq 24$ . Describe the periods, amplitudes, and locations of local maximums and minimums of the functions. How are the functions alike? How are they different? Do the graphs intersect? If so, where?