

Practice TEST: 4.1-4.5—Calculator Permitted

Part I: Multiple Choice

_____ 1. What is the period of the following sinusoid: $y = 5 - 3 \cos\left(\frac{2\pi}{3} + \frac{4\pi}{3}x\right)$?

(A) $\frac{2\pi}{3}$ (B) $\frac{4\pi}{3}$ (C) $\frac{3}{2}$ (D) 2 (E) 3

_____ 2. What is the simplified, exact value of $\tan \frac{2\pi}{3}$?

(A) $-\frac{\sqrt{3}}{3}$ (B) $-\sqrt{3}$ (C) 1 (D) -1 (E) DNE

_____ 3. Which of the following angles is coterminal with $\frac{447755\pi}{7}$?

(A) $\frac{3\pi}{7}$ (B) $\frac{5\pi}{7}$ (C) $\frac{9\pi}{7}$ (D) $\frac{11\pi}{7}$ (E) π

_____ 4. Which of the following is equal to $\sec^{-1} 0.5$?

(A) 0.524 (B) 2.086 (C) 1.047 (D) 1.139 (E) undefined

_____ 5. For $\theta = 276.798^\circ$, Find the reference angle, θ_{ref}

(A) 6.798° (B) 83.202° (C) 273.656° (D) 276.798° (E) $\frac{\pi}{6}$

_____ 6. If the terminal ray of θ passes through the point $(-1, -2)$, then $\tan \theta = ?$

(A) $\frac{1}{2}$ (B) 2 (C) $-\frac{\sqrt{5}}{2}$ (D) $-\sqrt{5}$ (E) $-\frac{\sqrt{5}}{5}$

_____ 7. From the unit circle, which angle θ , $0 \leq \theta < 2\pi$ has a cotangent value of $-\sqrt{3}$?

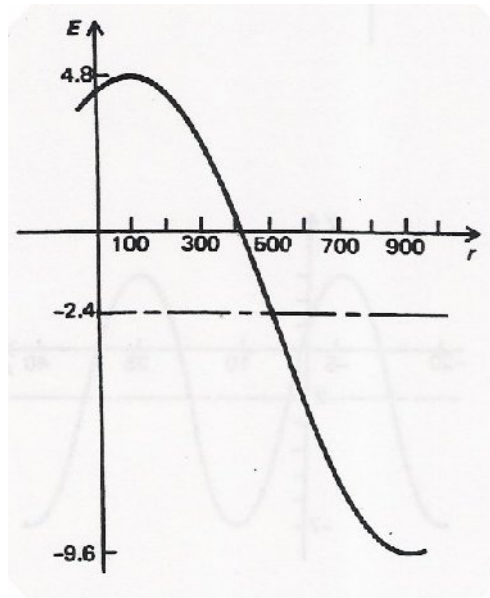
(A) $\frac{2\pi}{3}$ (B) $\frac{5\pi}{6}$ (C) $\frac{7\pi}{6}$ (D) $\frac{4\pi}{3}$ (E) $\frac{5\pi}{3}$

_____ 8. For the given graph shown at right, find the value of $|B|$ for its equation.

(A) 800 (B) 1600 (C) $\frac{\pi}{400}$ (D) $\frac{\pi}{900}$ (E) $\frac{\pi}{800}$

_____ 9. For the graph at right, what is the Amplitude, $|A|$, of the function?

(A) 7.2 (B) 4.8 (C) -9.6 (D) -2.4 (E) 14.4



- _____ 10. For the graph from #10 and #11 what would the value of C be in the form $y = Af(B(x - C)) + D$ for a **positive sine** equation
 (A) 100 (B) -300 (C) -500 (D) 500 (E) 900
- _____ 11. The angle $\frac{6\pi}{19}$ expressed in degrees, minutes, seconds is
 (A) $570^{\circ}0'0''$ (B) $56^{\circ}34'29.065''$ (C) $56^{\circ}50'31.579''$ (D) $18^{\circ}5'36.255''$ (E)
 $181^{\circ}26'11.886''$
- _____ 12. Evaluate: $\cot^{-1}(-2.6)$
 (A) undefined (B) -0.831 (C) -0.367 (D) 1.662 (E) -1.204
- _____ 13. The angle $\theta = -47845168^{\circ}$ terminates in which quadrant?
 (A) I (B) II (C) III (D) IV (E) on an axis
- _____ 14. Approximately how many cycles will the function $f(x) = 2 \cos 4\pi x$ have from 0 to 2π ?
 (A) 12.5 (B) 4 (C) 2 (D) 0.5 (E) 0.25
- _____ 15. The period of the function $f(x) = 2 - 4 \tan 3x$ is what?
 (A) 2 (B) 3 (C) 4 (D) $\frac{2\pi}{3}$ (E) $\frac{\pi}{3}$

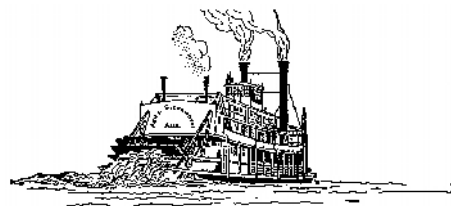
Part II: Free Response

Show all work. Give simplified, exact answers when specified, otherwise round to **three decimals**. Avoid intermediate rounding error. Box your final answers, **with units** when appropriate.



1. Mark Twain sat on the deck of a river steamboat. As the paddlewheel turned, a **point** on the paddlewheel blade moved in such a way that its distance, d in feet, from the water's surface was a sinusoidal function of time, t in seconds. When his stopwatch read 4 seconds, the point was at its highest, 16 ft above the water's surface. The wheel's diameter was 18 ft and rotates at 6 RPMs (revolutions per minute).

- a) What is the period of the paddle wheel?
- b) Sketch at least 2 cycles of the graph of the sinusoid. Be sure to label and scale both your axes. Show it crossing the y -axis.
- c) Write an equation of your graph modeling the height at time t .
- d) Use your equation to find where the point on the paddlewheel is when Mark's stopwatch read (also tell whether the point is traveling up or down, and whether it is above or below water.):
 - i) At the instant he started his stopwatch
 - ii) 5 seconds
 - iii) 8 seconds
 - iv) 17 seconds
- e) What is the first positive value of time at which the point was at the water's surface? At that time, was it going into or coming out of the water? **EXPLAIN**.



2. Given $y = -2 \cos\left(\frac{4}{3}x + \frac{\pi}{3}\right) - \frac{1}{2}$

- a. Write the equation in standard transformation form.
 - b. How many cycles will this graph have from 0 to 2π ?
 - c. What is the period?
 - d. What is the equation of the sinusoidal axis.
 - e. By what amount is the phase shift? Left or right?
 - f. What is the Range?
 - g. Sketch two cycles of this equation, show all (and only all) important information, including max, min, sinusoidal axis, and the final critical values.
 - h. Write an equivalent (but different) equation for this sinusoid in terms of
 - i. Positive sine
 - ii. Negative sine
 - iii. Negative cosine
 - i. If the graph from the **original equation** was shifted right $\frac{7\pi}{4}$ and shifted up 2 units, what would the new equation of the graph be?
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