

Test #2

Instructions: Answer all problems correctly. Calculators are NOT allowed. Each starred problem is extra credit, and each ★ is worth 5 points. A maximum of 110 points (out of 100) will be awarded on this test.

1. (12 points) (A warm-up.) Consider the graph of the function $y = 5 \sin(3x)$.

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(a) What is the amplitude of the function?

(b) What is the period?

2. Consider the graph of the function $y = 4 - 3 \cos\left(\frac{x}{2} - \frac{2\pi}{3}\right)$.

(a) (3 points) What is the exact value of the amplitude of this function?

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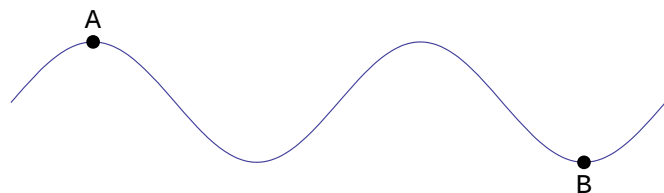
(b) (3 points) What is the exact value of the period?

18

(c) (10 points) Give the exact (x, y) coordinates for some point at which the curve has a relative minimum.

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3. (12 points) Consider the function whose graph, a sinusoidal curve, is below. The coordinates of the points shown are $A = (-\pi, 2)$ (at a relative maximum) and $B = (\pi, -2)$ (at a relative minimum). 40



- (a) (5 points) What is the exact value of the amplitude of this function?

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- (b) (5 points) What is the exact value of the period?

50

- (c) (10 points) Write an exact formula for the function.

60

4. (4 points) *Say, you might have missed some of these last time. Here's another chance.* Find exact algebraic values for each of the following, where defined. Otherwise, write “undefined.” 64

(a) $\sin 3\pi/4$

(c) $\sin(-\pi/2)$

(b) $\cos 2\pi/3$

(d) $\tan(5\pi/6)$

5. (12 points) “Geometric Identities” — Use what you know about the unit circle or graphs of functions to simplify the following. As an example, $\sin(90^\circ - \theta)$ simplifies to $\cos \theta$. 76

(a) $\sin(-\theta)$

(b) $\cos(\pi + x)$

(c) $\tan(\theta + \pi)$

(d) $\cos(90^\circ + y)$

6. (10 points) One gear turns another. The radii of the gears are 9.00 inches and 12.00 inches. If the larger gear rotates through an angle of 60° , how much does the smaller gear turn (in degrees)? [Simplify this one.] 86

7. (12 points) Shreveport is located at a geographic latitude of 32.2°N . Eureka Springs, AR, is due north of Shreveport at 36.1°N . How far apart are the two cities (as the crow flies), in miles? (Hint: As you well know, the earth is approximately spherical, with a radius of about 3960 miles.) [Leave in calculator-ready form.]

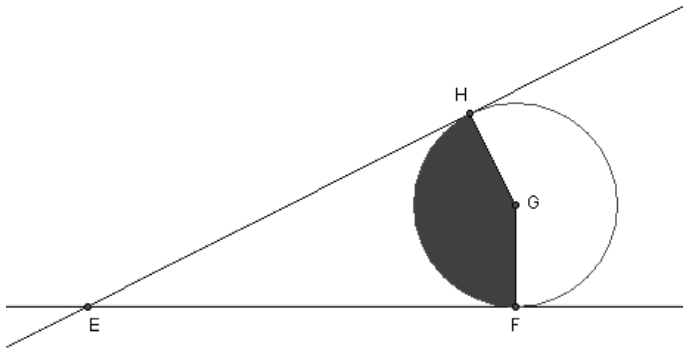
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8. (10 points) The moon revolves in its orbit around the earth once every 27.3 days (with respect to the fixed background of the stars). You might recall that the radius of the moon's orbit about the earth is about 239,000 miles. Calculate the linear speed of the moon relative to the earth. [Leave in calculator-ready form.]

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*** Extra Credit ***

- A.) (★) Suppose that $\theta = \angle HEF$ (in radians) and that the radius of the circle shown is r . Find the area of the shaded region.



- B.) (★...★) Ask a question you wish I had asked and answer it. Points will vary.