

Name Solutions

1. There are no notes or calculators allowed on this test.
2. All students will be expected to adhere to the academic code of conduct. It is always a violation of the university honor code to, in any way, assist another person in the completion of this exam or to copy answers from another student. Please keep your eyes on your own work and keep you own work covered up as much as possible during the exam so that others will not be tempted or distracted. Thank you for your cooperation.
3. Please mute/turn off all cell phones or pagers
4. Show all work for full credit. Guess and check for word problems will receive little or no credit.
Box your final answers.
5. You do not need to do the problems in the order that they appear.
6. There are 100 possible points on the exam.

Good Luck!

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1. (8 points) Solve for x.

$$\log_{36}(x^2 + x) = 1/2$$

$$x^2 + x = 36^{1/2}$$

$$x^2 + x = 6$$

$$x^2 + x - 6 = 0$$

$$(x+3)(x-2) = 0$$

$$x = 2 \text{ or } x = -3$$

2. (8 points) Write the expression as a logarithm of a single quantity.

$$2\log_{10}(x) - 3\log_{10}(y)$$

$$\log_{10} x^2 - \log_{10} y^3$$

$$\log_{10} \frac{x^2}{y^3}$$

3. (9 points) Expand: Make sure that there are no logarithms of products, quotients or powers.

$$\ln \frac{\sqrt{(x)(x-4)}}{(x+1)}$$

$$\ln \sqrt{x(x-4)} - \ln(x+1)$$

$$\ln \sqrt{x} + \ln(x-4) - \ln(x+1)$$

$$\frac{1}{2} \ln x + \ln(x-4) - \ln(x+1)$$

4. (9 points) Solve for x.

$$\log_5(3x-2) = 1 + \log_5(x-4)$$

$$\log_5(3x-2) - \log_5(x-4) = 1$$

$$\log_5 \left(\frac{3x-2}{x-4} \right) = 1$$

$$\frac{3x-2}{x-4} = 5^1$$

$$3x-2 = 5(x-4)$$

$$3x-2 = 5x-20$$

$$18 = 2x$$

$$9 = x$$

5. (21 points) Evaluate each expression.

$$(1) \quad \text{a. } \sin(60^\circ) = \frac{\sqrt{3}}{2}$$

$$(2) \quad \text{b. } \sin(90^\circ) = 1$$

$$(3) \quad \text{c. } \cos(\pi/6) = \frac{\sqrt{3}}{2}$$

$$(4) \quad \text{d. } \sin(315^\circ) = -\frac{1}{\sqrt{2}} \text{ or } -\frac{\sqrt{2}}{2}$$

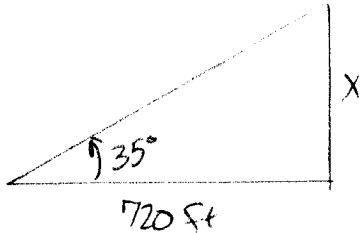
$$(5) \quad \text{e. } \sin(7\pi/6) = -\frac{1}{2}$$

$$(6) \quad \text{f. } \sin(-7\pi/6) = +\frac{1}{2}$$

$$(7) \quad \text{g. } \tan(17\pi/6) = -\frac{1}{\sqrt{3}} \text{ or } -\frac{\sqrt{3}}{3}$$

$$\tan\left(\frac{17\pi}{6}\right) = \tan\left(\frac{12\pi}{6} + \frac{5\pi}{6}\right) = \tan\left(\frac{5\pi}{6}\right)$$

6. (7 points) A person standing 720 feet from the base of Mt. Rushmore looked up to the top of the mountain at an angle of 35° . Write an equation for the height of the mountain. (You do not need to simplify trig functions).



$$\tan 35^\circ = \frac{x}{720} \quad (5)$$

$$720 \tan 35^\circ = x \quad (7)$$

7. (8 points)

a. Convert $5\pi/3$ to degrees.

$$\frac{5\pi}{3} \cdot \frac{180^\circ}{\pi} = \frac{5 \cdot 180^\circ}{3} = 300^\circ$$

b. Convert 130° to radians.

$$130^\circ \cdot \frac{\pi}{180^\circ} = \frac{13\pi}{18}$$

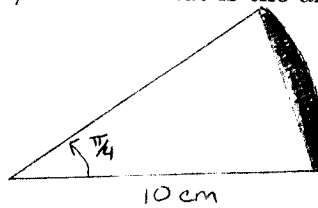
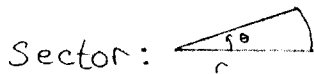
8. (7 points) A ball on the end of an 11 inch string is being spun around in a circle. What angle has the string rotated when the ball has traveled 5 inches? (Specify whether your answer is in radians or degrees)



$$\theta = \frac{s}{r}$$

$$\theta = \frac{5}{11} \text{ radians}$$

9. (9 points) Given that the area of a sector is given by $A = 1/2r^2\theta$ and the area of a triangle is given by $A = 1/2absin\theta$ what is the area of the shaded region?



Find the area of the shaded region:

$$A = \text{Area of sector} - \text{Area of triangle}$$

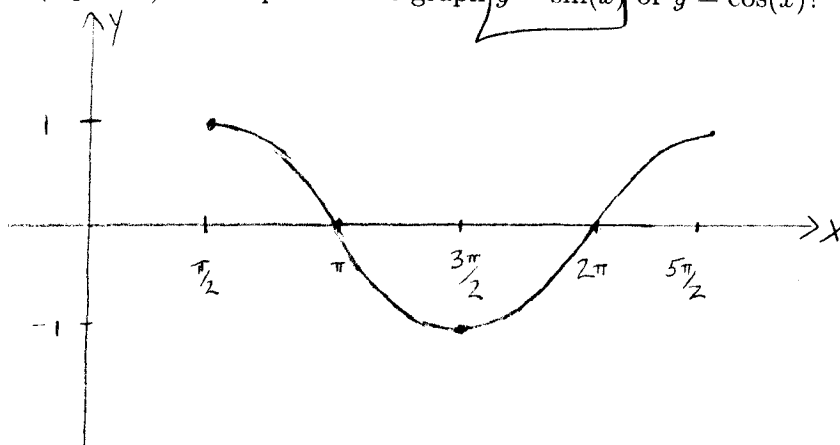
$$A = \frac{1}{2}(10)^2 \frac{\pi}{4} - \frac{1}{2}(10^2) \sin \frac{\pi}{4}$$

$$= \frac{50\pi}{2} - 50 \sin \frac{\pi}{4}$$

$$A = \frac{25\pi}{2} - (50 \times \frac{1}{\sqrt{2}})$$

↓
or $25\sqrt{2}$

10. (5 points) Is this part of the graph $y = \sin(x)$ or $y = \cos(x)$?



11. (9 points) Simplify (Hint: Use an identity)

$$\frac{1 + (\tan \theta)^2}{\cos \theta}$$

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

$$\tan^2 \theta + 1 = \frac{1}{\cos^2 \theta}$$

↖ or $\sec^2 \theta$

$$\frac{1 + \tan^2 \theta}{\cos \theta} = \frac{\sec^2 \theta}{\cos \theta}$$

$$= \frac{1}{\cos \theta} \cdot \frac{1}{\cos^2 \theta} = \frac{1}{\cos^3 \theta} = \sec^3 \theta$$

either of these is okay