

Math 150 **NEATLY PRINT NAME:** _____

Exam 3 **STUDENT ID:** _____

Fall 2009 **DATE:** _____

SECTION: Circle your correct section number.

Tuesday recitations: 501 503 505 507 509 511 525 527 529

Thursday recitations: 502 504 506 508 510 512 526 528 530

TEST NO.: *LOVE*

"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work."

Signature of student

Academic Integrity Task Force, 2004
<http://www.tamu.edu/aggiehonor/FinalTaskForceReport.pdf>

My signature in this blank allows my instructor to pass back my graded exam in class or allows me to pick up my graded exam in class on the day the exams are returned. If I do not sign the blank or if I am absent from class on the day the exams are returned, I know I must show my Texas A&M student ID during my instructor's office hours to pick up my exam.

Signature of student _____

NO CALCULATORS ALLOWED!

This is a 10-question multiple-choice exam; there is no partial credit. Each problem is worth 5 points for a total of 50 points. There will be a 5-point bonus if you have no transgressions. Transgressions include not having the correct Scantron form 882E, not filling out your Scantron form correctly, having a folded or mutilated Scantron, having your cell phone ring or vibrate, not having your TAMU student ID, not following directions, not turning in your exam and Scantron on time (you must be finished filling in your Scantron and exam cover before time is called). *The Scantron will not be returned so also mark all your answers on this test paper.*

SCANTRON: Please double check to make sure you have completed your Scantron correctly, as shown below.

Name: print your name neatly
Subject: Math 150
Date: November 2009

Test No.: *LOVE*
Period: your section number

1. Expand $f(x) = \log_5 \left(\frac{(x+2)^4}{3x^2} \right)$.

- a. $4\log_5(x+2) - \log_5 3 + 2\log_5 x$
- b. $4\log_5 x + 4\log_5 2 - \log_5 3 + 2\log_5 x$
- c. $4\log_5 x + 4\log_5 2 - \log_5 3 - 2\log_5 x$
- d. $4\log_5(x+2) - \log_5 3 - 2\log_5 x$
- e. None of these

2. Convert $\frac{7\pi}{15}$ radians to degrees.

- a. 80°
- b. 84°
- c. 168°
- d. 86°
- e. 165°

3. Consider the following three statements.

- I. $e^{\ln x^{-4}} = x^{-4}$
- II. The domain of $y = \log_3(12-x)$ is $(-\infty, 12]$.
- III. $\log_3(8) = \frac{\ln 8}{\ln 3}$

- a. Only I and II are true.
- b. Only I and III are true.
- c. Only II and III are true.
- d. I, II, and III are true.
- e. I, II, and III are false.

4. If $y = -6\cos\left(x + \frac{\pi}{2}\right) + 3$, what are the amplitude, period, reflection, and vertical shift?

- a. Amplitude -6 , period 2π , reflected over x -axis, vertical shift 3 units up
- b. Amplitude 3, period $\frac{\pi}{2}$, reflected over the x -axis, vertical shift 3 units up
- c. Amplitude 3, period 2π , reflected over the y -axis, vertical shift 6 units up
- d. Amplitude 6, period 2π , reflected over the y -axis, vertical shift 3 units up.
- e. None of these.

5. A perfumer wants to have 200 ml of a 40% Love Potion perfume concentration. How much of a 28% Love Potion and how much of a 64% Love Potion is needed? Which system of equations can be used to solve this problem?

a. $x + y = 200$
 $28x + 64y = 80$

b. $x + y = 64$
 $40x + 28y = 200$

c. $x + y = 200$
 $28x + 64y = 8000$

d. $x + y = 64$
 $40x + 26y = 12800$

e. None of these

6. Which one of these is true?

- a. $\sin 2x = \cos^2 x - \sin^2 x$
 b. $\cos 2x = 2 \sin x \cos x$
 c. $\sin(x + y) = \sin x \cos y - \cos x \sin y$
 d. $\sin 2x = 2 \sin x \cos x$
 e. $\sin^2 x = \frac{1 - \sin 2x}{2}$

7. Find the horizontal and vertical asymptotes of $f(x) = \frac{3x^2 + 15x + 18}{2x^2 - 2x - 24}$

a. None of these

b. horizontal asymptote at $y = \frac{3}{2}$, vertical asymptote at $x = 4$

c. horizontal asymptote at $y = 4$, vertical asymptote at $x = \frac{3}{2}$

d. horizontal asymptote at $y = \frac{3}{2}$, vertical asymptotes at $x = -3$ and $x = 4$

e. horizontal asymptotes at $y = -3$ and $y = 4$, vertical asymptote at $x = \frac{3}{2}$

8. Which of the following three statements is true about $f(x) = \left(\frac{1}{2}\right)^{x-3} - 1$?

- I. $f(x)$ is increasing.
- II. $f(x)$ has a y-intercept at $(0,7)$.
- III. $f(x)$ has a horizontal asymptote at $y = -1$.

- a. Only I is true.
- b. Only II is true.
- c. Only III is true.
- d. Only I and III are true.
- e. Only II and III are true.

9. The number of bacteria in a Petri dish is given by $P(t) = 0.1(3)^{0.9t}$ thousand bacteria, where t is in days. Find the exact time when the population will reach 20,000 bacteria. (Hint: It may be helpful to use fractions where possible.)

- a. $\frac{10 \ln 200}{9 \ln 3}$ days
- b. $\frac{9 \ln 200}{10 \ln 3}$ days
- c. $\frac{10 \ln 3}{9 \ln 200}$ days
- d. $\frac{10 \ln 20000}{9 \ln 3}$ days
- e. $\frac{9 \ln 20}{10 \ln 3}$ days

10. Find the area of the sector subtended by a central angle of $\frac{7\pi}{10}$ radians in a circle with radius 40 cm.

- a. $560\pi \text{ cm}^2$
- b. $1120\pi \text{ cm}^2$
- c. $14\pi \text{ cm}^2$
- d. None of these
- e. $28\pi \text{ cm}^2$

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TEST NO.: **FAMILY**

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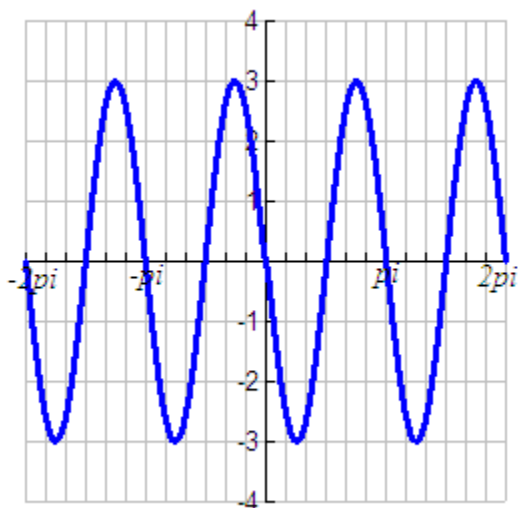
Signature of student _____

**You must clear your calculator BEFORE and AFTER the exam.
MEM (2nd +), Reset, ALL, Reset**

This is a 10-question work-out exam. Each problem is worth 5 points for a total of 50 points. Write all solutions in the space provided as full credit will not be given without complete, correct accompanying work, even if the final answer is correct. Fully simplify all your answers, and give exact answers unless otherwise stated. Justify your answers algebraically whenever possible. Circle your final answer. Remember your units!

So far as Napier's invention of logarithms is concerned, Lord Moulton expressed the fact very clearly when he stated: "The invention of logarithms came on the world as a bolt from the blue. No previous work had led up to it, foreshadowed it or heralded its arrival. It stands isolated, breaking in upon human thought abruptly without borrowing from the work of other intellects or following known line of mathematical thought."

1. Write a function of the form $f(x) = a \sin k(x-b)$, whose graph is shown below, where a , k , and b are **positive**, and b is as small as possible.



$f(x) =$ _____

2. Prove the trig identity $\sin x = \frac{1 - \cos^2 x}{\sin x}$.

3. *Exactly* and algebraically solve $5e^{2x}x^2 + 210e^{2x} = 65xe^{2x}$ for x .

4. In interval notation, what is the domain of the function $h(x) = \frac{\sqrt[4]{x-5}}{\log_{17}(18-x)}$?

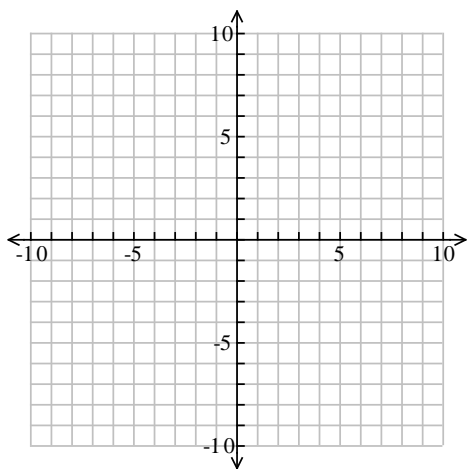
Domain (interval notation): _____

5. *Exactly* and algebraically solve the system of equations:

$$3(x+4)^2 + y = 12$$

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

6. Graph $f(x) = \frac{4x-8}{2x^2-12x+16}$ below. Clearly identify and label the horizontal and vertical asymptotes and any holes.



7. If the half-life of a radioactive substance is 13 years, *exactly* how long will it take for 400 grams of this substance to decay to 300 grams? Remember your units!

5-point bonus: *Exactly* evaluate $\cos\left(\frac{19\pi}{12}\right)$.

8. Solve the following equation for x . Find both an exact and an approximate value for x .

$$\ln(x+1) = 1 + \ln(x-1)$$

Exact: $x =$ _____

Approximate to 3 decimal places: $x \approx$ _____

9. If $\cot x = \frac{19}{11}$ where $\sin x < 0$, find the exact values of all the trigonometric functions.

$\sin x =$ _____

$\cos x =$ _____

$\tan x =$ _____

$\csc x =$ _____

$\sec x =$ _____

10. For what *exact* value of a makes the system of equations $\begin{cases} 6x - 7y = 42 \\ ax + 2y = 11 \end{cases}$ have no solution?

$a =$ _____