IUPUI Department of Mathematical Sciences
Departmental Final Examination

PRACTICE FINAL EXAM VERSION #1

MATH 15900

Precalculus

Exam directions similar to those on the departmental final.

1. **DO NOT OPEN** this test booklet until you are told to do so.
2. This is NOT the exam for MATH 15300 or 15400.
3. There are 7 pages in this exam with problems 1 to 21 and a bonus problem.
4. You MUST get a new exam from the proctor if your exam is incomplete.
5. PRINT your name and student ID# below.
6. MARK your section below.
7. You will have two hours to complete this examination.
8. A TI-30Xa calculator is permitted, no other calculator is allowed.
9. No scrap paper, notes, books, or collaborators are allowed.
10. Exact answers may contain π or radicals or logarithms.
11. Simplify all answers completely.
12. Problems involving units must have the units represented on the answer to receive full credit.

Name **(Print Clearly)**	
Student ID#	

Practice Departmental Final Exam Recommendations to Students:

- Take this practice final exam like an actual examination (not like doing homework). That is, create an "exam like" atmosphere. This practice exam should be taken after completing a thorough review of the material.
- Set aside a two-hour block of time with no interruptions (no facebook, texting, phone calls, restroom breaks, etc.).
- Do not use any help aids, such as notes, textbook, internet, scrap paper, MAC staff, etc.
- Work through all problems noting which concepts you know well and which ones you need to spend more time on.
- Grade your exam using the answers in the back of your textbook (the textbook section and exercise number is noted at the top right of each problem).
- Rework any problem on the exam that you missed and then work similar problems from the textbook until you can perform the operations without error.
- Follow the same recommendations for taking the Practice Final Exam Version #2.

MATH 15900 Practice Departmental Final Exam (Version #1)

TEXTBOOK: Swokowski & Cole, *Algebra & Trigonometry with Analytic Geometry*, Classic 12th Edition

To receive full credit you must show all your work. Simplify all answers completely. Be sure to check your final answers for errors. Problems involving units must have the units represented on the answer to receive full credit.

1. Factor the polynomial completely. (1.3 #79)

   $64x^3 - y^6$

   1. _____ (4)

2. ***Movie attendance*** Six hundred people attended the premiere of a motion picture. Adult tickets cost $9, and children were admitted for $6. If box office receipts totaled $4800, how many children attended the premiere?

   (2.2 #11)

   2. _____ (4)

3. ***Fencing a region*** A farmer plans to enclose a rectangular region, using part of his barn for one side and fencing for the other three sides. If the side parallel to the barn is to be twice the length of an adjacent side, and the area of the region is to be 128 ft^2, how many feet of fencing should be purchased?

   (2.3 #66)

   3. _____ (4)

4. Solve the equation. (2.5 #23)

   $x = 4 + \sqrt{4x - 19}$

   4. _____ (4)

5. Solve the inequality. Express the solution in **interval notation**. (2.7 #31)

$$\frac{x+1}{2x-3} > 2$$

5 _____ (4)

6. Given the following equations: (3.2 #21)

a) $y = 2x - 3$ b) $y = -4x^2$ c) $x = -y^2 + 3$

d) $y = -\frac{1}{2}x^3$ e) $y = x^3 - 8$ f) $y = \sqrt{x}$

i) Determine which are symmetric with respect to the *y*-axis?

6i) _____ (2)

ii) Determine which are symmetric with respect to the origin?

6ii) _____ (2)

7. ***Childhood growth*** For children between ages 6 and 10, height *y* (in inches) is frequently a linear function of age *t* (in years). The height of a certain child is 48 inches at age 6 and 50.5 inches at age 7. (3.4 #71)

a) Express *y* as a function of *t*.

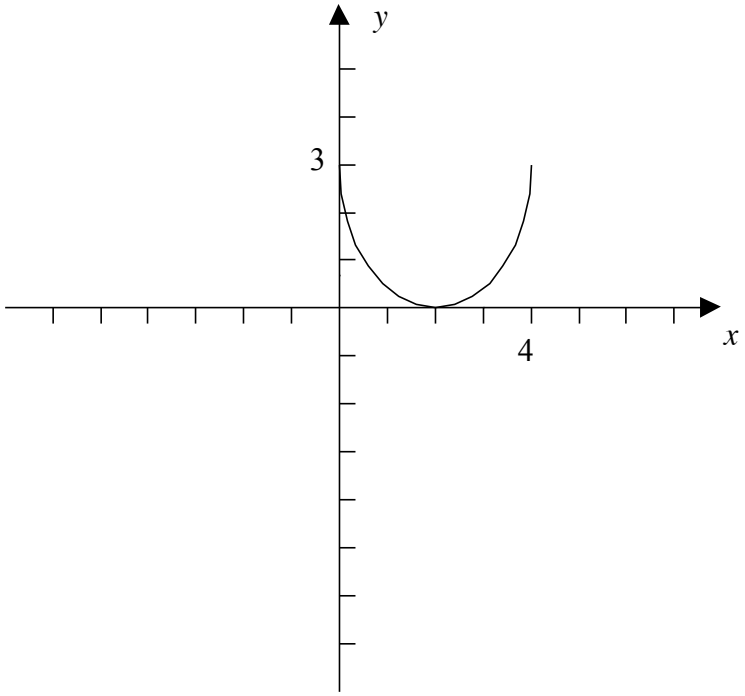
7a) _____ (4)

b) Predict the height of the child at age 10.

7b) _____ (4)

8. The graph of a function *f* with domain [0, 4] is shown below. Sketch the graph of $y = -f(x+2) - 3$ (3.5 #41i)

(4)



9. Given $f(x) = \dfrac{x-1}{x-2}$ and $g(x) = \dfrac{x-3}{x-4}$. (3.7 #33)

(a) Find $(f \circ g)(x)$.

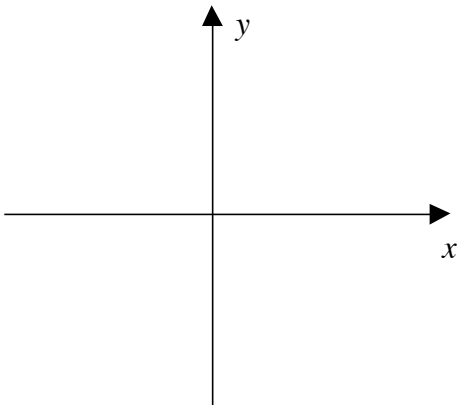
9a) _____ (4)

(b) Find the domain of $(f \circ g)(x)$.

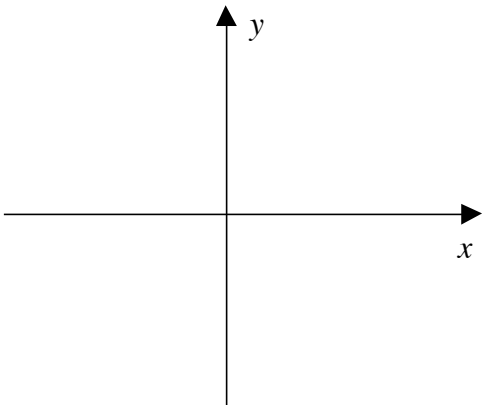
9b) _____ (4)

10. Sketch the graphs and dash in the asymptotes. (5.3 #1)

a) Graph $f(x) = e^{-x}$. (2)



b) Graph $f(x) = -e^{x}$. (2)



11. ***U.S. population growth*** The population $N(t)$ (in millions) of the United States *t* years after 1980 may be approximated by the formula $N(t) = 231e^{0.0103t}$. When will the population be twice what it was in 1980? (5.4 #63)

11. _____ (4)

12. Solve the equation. (5.5 #23)

$\ln(-4-x) + \ln 3 = \ln(2-x)$

12. _____ (4)

13. ***Compound interest*** Solve the compound interest formula $A = P\left(1+\frac{r}{n}\right)^{nt}$ for t using natural logarithms.

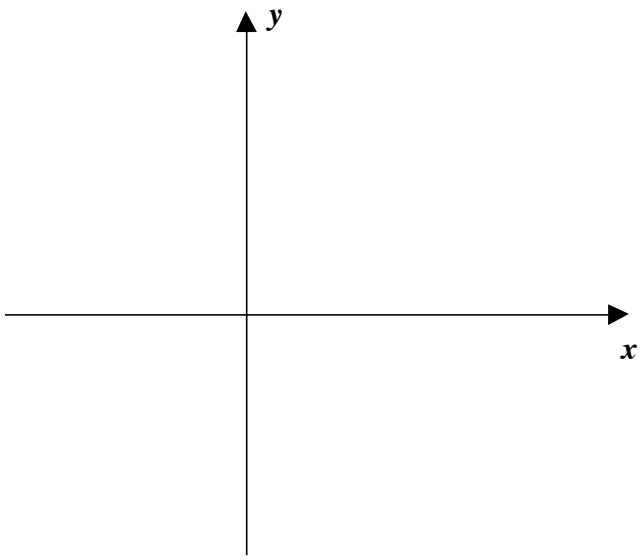
(5.6 #52)

13. _____ (4)

14. Find the foci, and sketch the graph of the ellipse showing the center, vertices and foci.

$4x^2 + 9y^2 - 32x - 36y + 64 = 0$ (11.2 #11)

(4)



15. ***Air travel*** An airplane, flying with a tail wind, travels 1200 miles in 2 hours. The return trip, against the wind, takes 2.5 hours. Find the cruising speed of the plane and the speed of the wind (assume that both rates are constant).

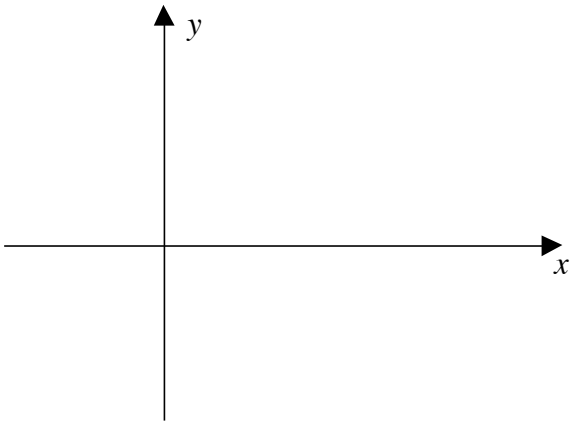
(9.2 #33)

15. _____ (4)

16. Use fundamental identities to write $\cot\theta$ in terms of $\sin\theta$, for any acute angle θ. (6.2 #43)

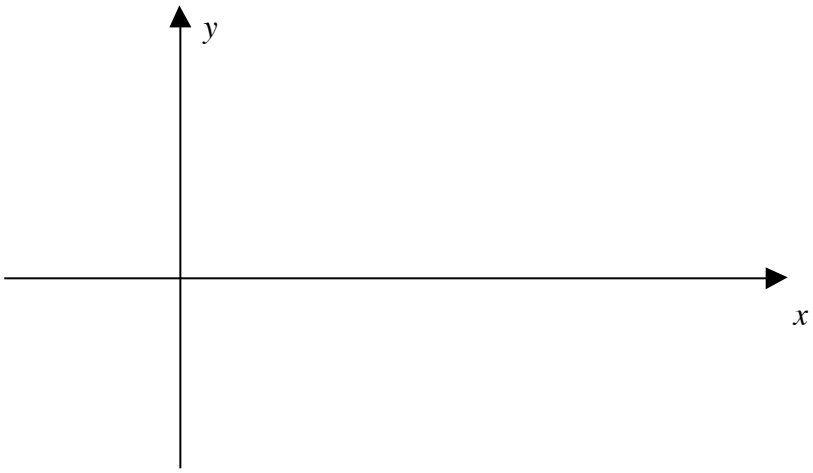
16. _____ (4)

17. Graph at least one complete period of $y = 1 + \csc x$. (6.3 #62)
(4)



18. Find the phase shift, and graph at least one complete period for $y = -2\sin(3x - \pi)$.

(6.5 #17)
(4)



19. Find **<u>all</u> exact values** for the solutions of the equation. (7.2 #17)

$$\sin\left(2x-\frac{\pi}{3}\right)=\frac{1}{2}$$

19. _____ (4)

20. Without using your calculator, find the **exact value** of the expression, if it is defined. (7.6 #15b)

$$\sec\left[\tan^{-1}\left(-\frac{3}{5}\right)\right]$$

20. _____ (4)

21. Approximate the area of a parallelogram that has sides of lengths a and b (in feet) if one angle at a vertex has measure θ.

$a=12.0$ ft, $b=16.0$ ft, $\theta=40°$

(8.2 #43)

21. _____ (4)

Bonus: ***Angles of a triangular plot*** A triangular plot of land has sides of lengths 420 feet, 350 feet, and 180 feet. Approximate the smallest angle between the sides.

(8.2 #18)

Bonus: _____ (4)