Your Name

Your Signature

Student ID #

Quiz Section

Professor's Name

TA's Name

SHOW YOUR WORK ON THIS TEST PAPER!

PLACE A BOX AROUND YOUR ANSWER whenever appropriate.

If you cannot complete a problem in the given space, then continue your work on the back of the page or on the back of the preceding page. *If you do continue your work any place other than the given space for a problem, make sure you note where it is so that the grader can find it.*

Answers with insufficient work shown may not get much credit. Show enough work on each problem for the grader to tell how you obtained your answer. This may also help you get partial credit if your answer is incorrect or incomplete. You are responsible for making your solutions readable. Using English phrases or sentences may help the grader understand your work.

THIS EXAM CONTAINS 11 PAGES PLUS A COVER PAGE; PLEASE MAKE SURE YOU HAVE A COMPLETE EXAM.

Problem	Total Points	Score
1	20	
2	15	
3	15	
4	20	
5	15	
6	15	
Total	100	

1. [**20 points total**](Short Answer and Computations)

(a) [**7 points**] Let $f(x) = 2x^2 - 3$. Simplify as far as possible; you should NOT have an h in the denominator of your final answer and you MUST show the algebra steps:

$$\frac{f(x+h) - f(x) + h}{h}$$

(b) [**2 points**] In part (a), what is the value of the final expression when $h = 0$?

1.(Continued)

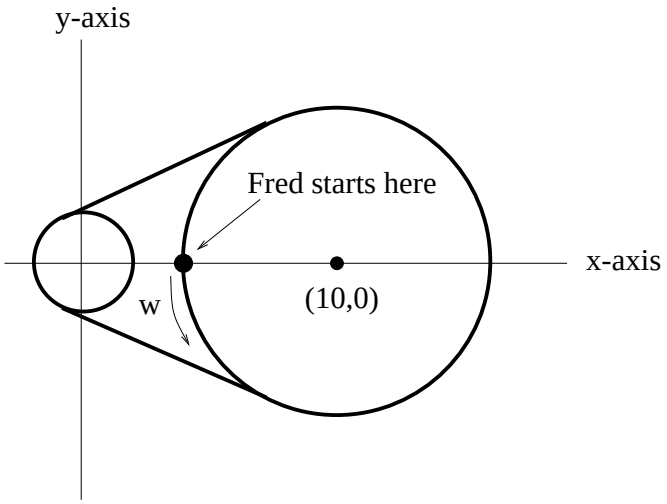
(c) [**6 points**] Let $f(x) = 9\sin(x) - 2$, $d(x) = 5x$ and $s(x) = x + 1$.

(i) $f(d(s(x))) =$

(ii) Find the period B and phase shift C of the function $f(d(s(x)))$.

(d) [**5 points**] Solve the equation $4 = 3^{x^2-1}$; find ALL solutions. Give four decimal places of accuracy.

2. [**15 points total**] Two wheels are connected by a belt as pictured. Impose the coordinate system as drawn and assume Fred is at the indicated position when the wheels start turning. Fred has an angular speed $\omega = 4$ rad/sec. The radius of the BIG wheel is 6 feet and the radius of the SMALL wheel is 2 feet. The BIG wheel is centered at the location $(10, 0)$ and the SMALL wheel is centered at the origin of the coordinate system.



(a) [**2 points**] What is Fred's angular speed in RPM units? Give the EXACT answer; do not round off.

(b) [**2 points**] What is Fred's linear speed in ft/sec?

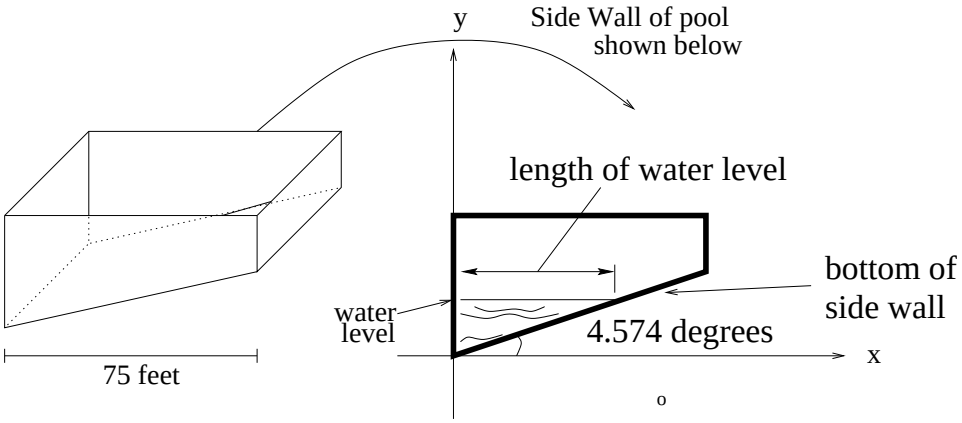
(c) [**2 points**] What is the angular speed of the small wheel in units of rad/sec?

2.(Continued)

(d) [**5 points**] Find parametric equations that describe Fred's location at time t seconds.

(e) [**4 points**] Find Fred's coordinates after 2 seconds. Mark his location at time $t = 2$ seconds in the picture. Give two decimal places of accuracy.

3. [**15 points total**] When the hot weather arrives, you fill up your back-yard swimming pool, which is 75 feet long. The floor of the pool slopes upward from the deep end to the shallow end, as shown. The left-hand figure gives a three-dimensional view of the pool and the right-hand picture shows the profile looking at the trapazoidal shaped side. We impose a coordinate system as pictured.



Drawing not to scale.

(a) [**3 points**] What is the equation of the line modeling the bottom of the side wall?

(b) [**2 points**] If the shallow end is 4 feet deep, how deep is the deep end of the pool?

3.(Continued)

(c) [**4 points**] Water drains from the pool in such away that the height of the water after t hours is given by $h = 10 - 0.5t$ feet. When is the length of the surface of the water 60 feet?

(d) [**6 points**] Find a multi-part formula for the length of the surface of the water level at time t. Clearly state the domain of each part of your formula.

4. [**20 points total**] Sean received a $400 bonus at work. He decided to save it for emergencies. He put it into a certificate of deposit (cd) which pays 8% interest, compounded monthly.

Karen won $250 on a "Scratch-N-Sniff" lottery ticket. She purchases several shares of Amazon.com stock with her winnings. After 2 years, her stock is worth $375.

(a) [**3 points**] Find a formula, $S(t)$, for the value of Sean's cd at time t, in years.

(b) [**4 points**] When will his cd be worth $700? Give one decimal place of accuracy.

4.(Continued)

(c) [**4 points**] Assume that the value of Karen's amazon.com stock is given by a continuously compounding model; i.e. assume $K(t) = K_0 e^{rt}$. Find the formula for $K(t)$. Calculate r to 4 decimal places of accuracy.

(d) [**4 points**] According to your model, when will Karen's stock be worth \$700? Use one decimal place of accuracy.

(e) [**5 points**] When will Karen's stock have the same value as Sean's cd? Use one decimal place of accuracy.

5. [**15 points total**]The following function represents the enrollment in PUBLIC schools:

$$E(t) = 0.104t^2 - 17.7t + 789,$$

where t is the year (t=0 corresponding to the year 1900) and $E(t)$ has values in terms of millions of students.

(a) [**2 points**] During which year was the enrollment in the public schools the minimum?

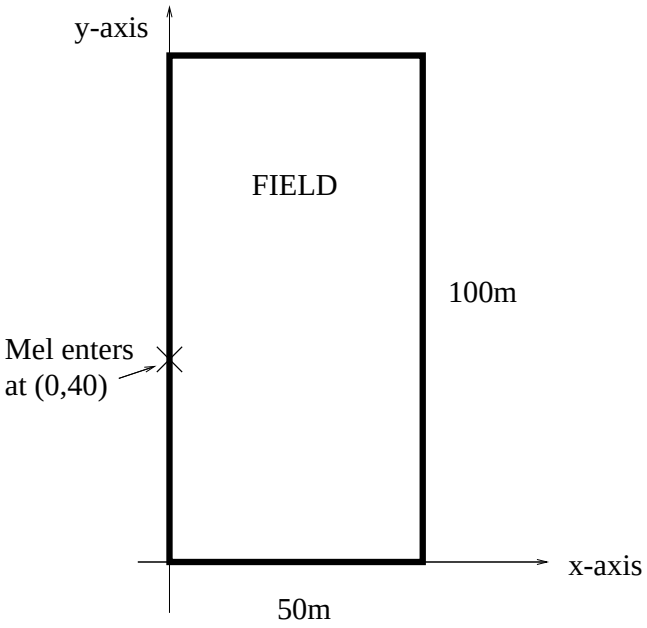
(b) [**6 points**] Suppose the enrollment in all PRIVATE schools can be described by a different quadratic function $F(t)$. In 1980, the enrollment in private schools was 12 million and in 1988 the enrollment was a maximum of 26 million. Develop a quadratic function, $F(t)$, that represents enrollment in private schools as a function of time.

5.(Continued)

(c) [**2 points**] Develop a NEW function $G(t)$ that represents the total enrollment in both public and private schools.

(d) [**5 points**] In what year is the total enrollment 63 million?

6. [**15 points total**] Mel is being chased by a swarm of bees. Mel enters a rectangular field of dimensions 50×100 meters at the pictured location; this is a picture looking down from above. Assume the parametric equations for Mel's motion are given by $x(t) = 3t$ and $y(t) = 40 + 3.4t$, where t is in units of seconds.



(a) [**2 points**] Where is Mel located at time $t = 8$ seconds?

(b) [**7 points**] WHERE and WHEN does Mel exit the field. Mark the exit location in the figure.

(c) [**6 points**] How long does it take Mel to run 400 meters?