Your Name


Your Signature


Quiz Section (circle one)

|  | Jeremy | Edwin |
| :---: | :---: | :---: |
| $11: 30$ | CA | CC |
| $12: 30$ | CB | CD |


| Problem | Total Points | Score |
| :---: | :---: | :---: |
| 1 | 22 |  |
| 2 | 16 |  |
| 3 | 12 |  |
| Total | 50 |  |

- You are not allowed to use any notes for this exam.
- You may use a scientific calculator, but not a graphing calculator. You are not allowed to share calculators.
- In order to receive partial credit, you must show your work. Be wary of doing computations in your head. Instead, write out your computations on the exam paper.
- Your answers should either be exact answers (like $2 \sqrt{2}$ ) or rounded to three digits after the decimal (like 2.828) in whatever units you're using. Be careful not to round intermediate calculations whenver possible.
- Place YOUR FINAL ANSWER to each question in the box provided.
- If you need more room, use the backs of the pages and indicate to the grader that you have done so.
- Raise your hand if you have a question.
- Good luck!

1 (22 points) Don and Ellen are scuba diving. Don is holding the safety line when Ellen drifts past him, heading up. At the same instant, Don lets go of the line and floats after Ellen. The depths of the two divers are given by

$$
\begin{aligned}
\text { Don's depth: } & D(t)=3 t^{2}-100 \\
\text { Ellen's depth: } & E(t)=t^{2}+3 t-100
\end{aligned}
$$

where $D$ and $E$ are in feet below the surface, and $t$ is in seconds since Don lets go.
(a) (6 points) When does each diver reach the surface?

Don: $\square$
Ellen: $\qquad$
(b) (5 points) After $t=0$, are the divers ever at the same depth? If so, find the time when this occurs. If it never happens, write "never" in the box.

$$
\text { At } t=\square
$$

(c) (5 points) A squid is swimming down so that its depth in the water (in feet) is given by the function

$$
S(t)=-20-3 t
$$

where $t$ is again in seconds since Don started up. When are Ellen and the squid at the same depth?

$$
\text { At } t=\square
$$

(d) (6 points) What is the greatest distance that Ellen is above Don, and when does this occur?


2 (16 points) Frank is out trick-or-treating on Halloween, and he gets spooked by a scary noise. He runs toward a streetlight illuminating a circular patch of ground. The graph below shows Frank's path as the straight line and the lit street as the circle (with the streetlight at the center, S). All units indicated are in feet.

(a) (6 points) Frank starts at the point $F$ (the origin in the given coordinate system), and runs in the indicated direction. Where (in the given coordinate system) does he exit the lit region?

$$
\text { At }(x, y)=\square
$$

(b) (4 points) Suppose Frank is running at 8 miles per hour. How long (in seconds) is he in the lamp light? (Recall that 1 mile is 5280 feet.)
$\qquad$
(c) (6 points) At what point (in the given coordinate system) is Frank closest to the streetlight (at the point $S$ in the center of the circle).

$$
\text { At }(x, y)=\square
$$

(a) (6 points) Here is the graph of $y=f(x)$ (on the left) and $y=f\left(\frac{1}{c}(x-d)\right)$ (on the right).



Find the constants $c$ and $d$.

$$
\begin{aligned}
& c=\square \\
& d=\square
\end{aligned}
$$

(b) (6 points) Find the equation for the multi-part function $f(x)$, and specify the domain. (You may assume that the graph of $f(x)$ consists of a quarter of a circle and a line segment.)


