# Math 112, Spring 2017, Midterm I 

April 18, 2017

Name
TA/Section

## Instructions.

- There are 4 questions. The exam is out of 40 points.
- You are allowed to use one page of notes written only on one side of the sheet in your own handwriting. It has to be the original and not a photocopy. Hand in your notes with your exam paper.
- You may only use a TI 30X IIS calculator.
- Show your work. If I cannot read or follow your work, I cannot grade it. You may not get full credit for a right answer if your answer is not justified by your work. Please BOX your final answer.

Copying from someone elses paper, using notes (unless expressly allowed by the teacher), altering an exam for re-grading, getting an advance copy of the examination, or hiring a surrogate test-taker are all flagrant violations of University policy.
Source: Student Academic Responsibility, University of Washington

| Question | points |
| :---: | :---: |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| Total |  |

1. Given $f(A+B)-f(A)=A B+B^{2}-3 B$, answer the following.
(a) ( 3 points) Find the average rate of change of $f(x)$ from $x=4$ to $x=7$.
(b) ( 3 points) Find the instanteneous rate of change of $f(x)$ at $x=4$.
(c) ( 3 points) If $f(0)=-2$, what is $f(3)$ ?
2. Differentiate the following functions. You do not have to simplify.
(a) (3 points) $f(x)=\frac{7}{x^{2}}+4 \sqrt{x}$
(b) $\left(3\right.$ points) $f(x)=\left(\frac{4 x-7}{x^{3}+1}\right)^{7}$
(c) ( 3 points) $f(x)=(9 x-8)^{2}\left(x^{2}+x+1\right)^{5}$
3. Mako the Orca is looking for salmon in Southern Puget Sound. His depth in feet at time $t$ in seconds is given by the function $s(t)=0.1 t^{3}-2.8 t^{2}+12.8 t+102.4$ where $0 \leq t \leq 22$. Include units with your answers where applicable.
(a) ( 3 points) Find Mako's instanteneous speed when $t=12$. Is he diving deeper or swimming towards the surface at this time?
(b) ( 4 points) When does he reach his maximum depth?
(c) ( 3 points) Graph the rate of change of depth of Mako on the axes below for $0 \leq t \leq 22$. When is he swimming fastest towards the surface?

(d) ( 1 point) At $t=0$, Yoda the Orca is at the same depth as Mako. Her rate of change of depth is given by $y(t)=2.048 t-20.48$ feet per second. Add the graph the rate of change of depth for Yoda to the above picture.
(e) ( 1 point) At $t=2$, seconds, are they getting closer or moving further apart?
(f) ( 1 point) At $t=2$, seconds, which orca is closer to the surface?
4. The revenue and cost functions for manufacturing and selling Tops are:

$$
R(x)=-2.5 x^{2}+80 x \quad \text { and } \quad C(x)=0.25 x^{3}-6 x^{2}+60 x+120
$$

where $x$ is in thousands of Tops and revenue and cost are given in thousands of dollars. Give units with your answers where applicable.
(a) ( 2 points) Approximate the cost of producing the 5001st Top.
(b) ( 5 points) Find the maximum profit.
(c) ( 2 points) At what quantity does the graph of marginal cost have a horizontal tangent line?

