

Math 122B

Exam I

October 6th 2014

The University of Arizona

Name: _____

Answers without adequate justification will not receive full credit, including multiple choice. Include units with your answer when appropriate, and box all answers unless an answer line is provided. By signing below I am agreeing to abide by the University of Arizona academic integrity policies and that all work done on this test is my own.

Signature: _____

Tips for Success:

- Look through the entire test before starting to prioritize questions.
- If you get stuck on a question, move on and come back to it later.
- Do a quick reality check after each question: does my answer make sense? Did I include units? Did I show all my work?
- Read over the entire test at the end to make sure you didn't miss anything.
- For each question: take a deep breath, think slowly and deliberately at first, then work quickly once you see what to do.

Requests:

- Show all your steps.
- Please box answers when possible.

1. For the following questions, give a *brief* explanation and/or sketch to justify your answer.

(a) If $f'(a) < f'(b)$, then $f(a) < f(b)$.

TRUE FALSE

(b) If $f'(a) < 0$, $f''(a) < 0$.

TRUE FALSE

(c) If $f''(x) > 0$ on the interval (a, b) , then $f(x)$ is increasing on the interval (a, b) .

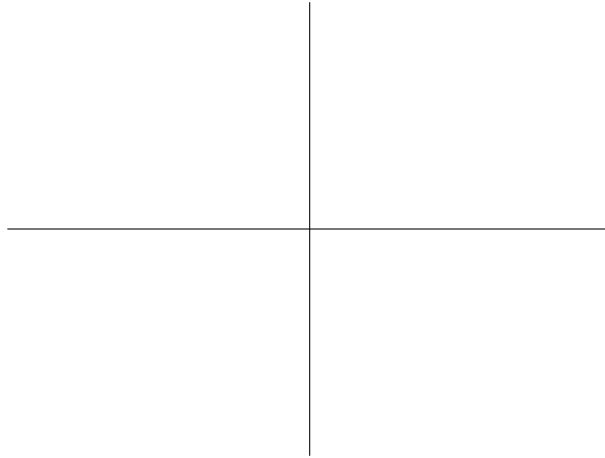
TRUE FALSE

2. Let $f(x) = \sqrt{ax}$, where $a > 0$ is constant.
- (a) *Using the limit definition*, compute $f'(x)$. Your answer will involve a ; no points will be given for just using the power rule (but it's a good way to check your answer!).

- (b) Suppose $a = 2$. *Estimate* $f'(3)$. Use your calculator, but include a table of values.

3. Let $F(t) = |t^3|$.

- (a) Sketch a graph of $y = F(t)$ on the axes below, and label 3 points. Hint: consider $t < 0$ and $t > 0$ separately.



- (b) Is $F(t)$ differentiable everywhere? If not, pick a point where you think $F'(t)$ does not exist and *explain why it doesn't exist by **estimating** limits*. You may use your calculator, but you must explain your work and include values.

4. While riding a roller coaster, you record your height (in feet) above the ground at various times t (in seconds). Here are a few of your values:

t	30	31	32	33	34
H	300	210	90	10	50

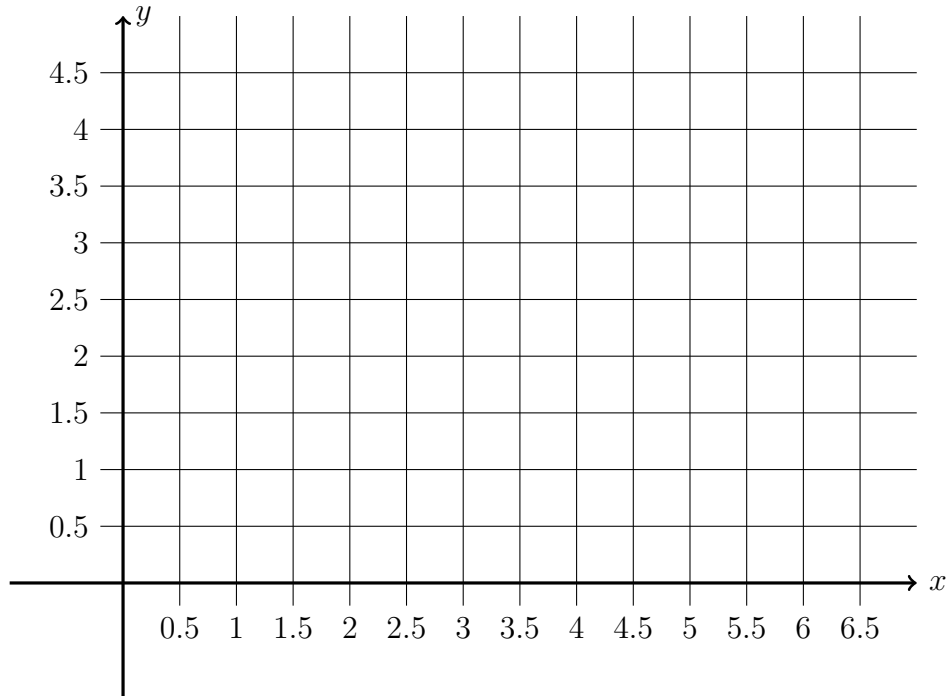
- (a) Compute your average (vertical) velocity from $t = 30$ to $t = 34$.

- (b) Approximate and interpret $H'(32)$.

- (c) What do you think the *sign* of $H''(33)$ is? Explain using a sketch.

5. On the axes below, draw the graph of a function $y = f(x)$ with the following properties:

- $f(0) = f(6) = 4$
- $f'(x) < 0$ on $[0, 3)$
- $f'(3) = 0$
- $f'' < 0$ on $[0, 2)$ and $(4, 6]$
- $f'' > 0$ on $(2, 4)$.



6. Find the equation of the tangent line to $y = x^{-1/2} \cdot 2^x$ at $x = 1$.

7. Suppose that $g(3) = A$, $h(3) = B$, $g'(3) = 1/2$ and $h'(3) = -1$. Write the equation of the tangent line to the graph $y = 2g(x) - h(x)$ at $x = 3$.

8. The graphs of $y = f(x)$, $y = f'(x)$ and $y = f''(x)$ are shown below. Identify each graph below using 'solid', 'dashed' or 'dotted'.

