

Math 124 - Fall 2017

Exam 2

November 21, 2017

Name: _____

Section: _____

Student ID Number: _____

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- There are 6 pages of questions. Make sure your exam contains all these questions.
- You are allowed to use a Ti-30x IIS Calculator model ONLY (**no other calculators allowed**). And you are allowed one **hand-written** 8.5 by 11 inch page of notes (front and back).
- Leave your answer in exact form. Simplify standard trig, inverse trig, natural logarithm, and root values. Here are several examples: you should write $\sqrt{4} = 2$ and $\cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$ and $\frac{7}{2} - \frac{3}{5} = \frac{29}{10}$ and $\ln(1) = 0$ and $\tan^{-1}(1) = \frac{\pi}{4}$.
- Show your work on all problems. The correct answer with no supporting work may result in no credit. **Put a box around your FINAL ANSWER for each problem and cross out any work that you don't want to be graded.**
- If you need more room, use backs of the pages and indicate to the grader that you have done so.
- Raise your hand if you have a question.
- There may be multiple versions of the exam so if you copy off a neighbor and put down the answers from another version we will know you cheated. Any student found engaging in academic misconduct will receive a score of 0 on this exam. All suspicious behavior will be reported to the student misconduct board.
- You have 80 minutes to complete the exam. Budget your time wisely.
SPEND NO MORE THAN 10 MINUTES PER PAGE!

GOOD LUCK!

1. (10 pts) (Remember, give simplified exact values in your final answers as indicated on cover)

(a) Find the slope of the tangent line to $y = \arctan(\sqrt{x}) \ln(3x^2 - 1)$ at $x = 1$.

(b) Find $\frac{dy}{dx}$ for $y = x^{\sin(\pi x)}$.

2. (10 pts) Consider the curve implicitly defined by $x^2y^3 - \frac{1}{x+y^2} = 5$.

(a) The point $(x, y) = (-2, 1)$ is on the curve.

Find the equation for the tangent line to the curve at $(-2, 1)$.

(b) Use the tangent line approximation at $(-2, 1)$ to approximate a y -coordinate on the curve when $x = -1.9$. (Give you answer to 4 places after the decimal point)

3. (10 pts) At time t , the location of a particle is given by:

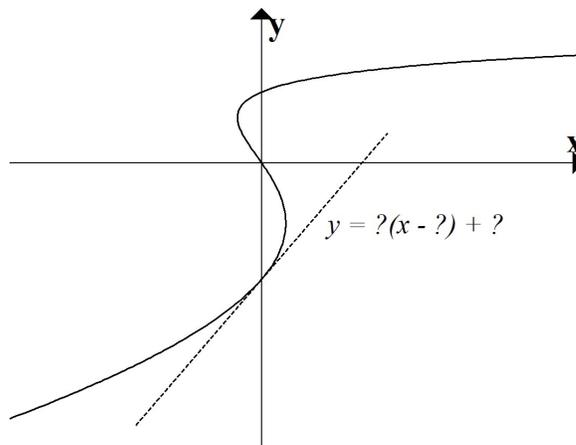
$$x = t^3 - t \quad , \quad y = 8te^{(-t/4)}$$

(a) Find all times t when the curve has a horizontal or vertical tangent.

i. Horizontal Tangent time(s):

ii. Vertical Tangent time(s):

(b) Find the equation for the tangent line at the negative y -intercept (shown in picture). Leave your numbers in exact form.



4. (10 pts) Find the absolute max and min of $f(x) = \frac{x-2}{x^2-3x+3}$ on the interval $x = 2$ to $x = 10$.
(Clearly, check all appropriate points and label your final answers).

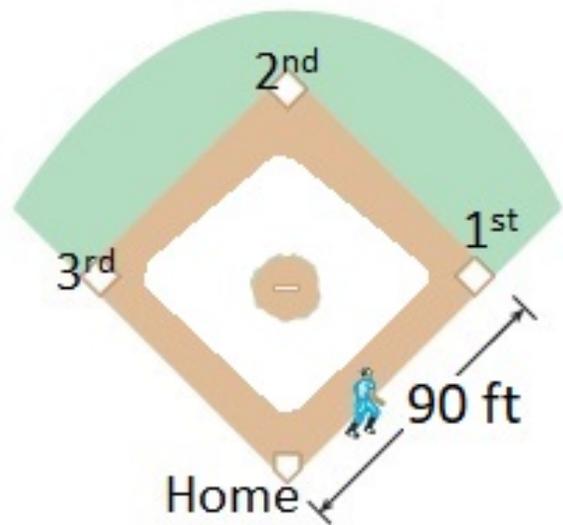
5. (10 pts) A baseball diamond is a square with sides of length 90 ft. Kyle hits the ball and runs toward first base.

At the instant Kyle has run 30 feet, he is running at 24 ft/sec.

At this same instant, there is another runner, Nelson, 40 ft from home, between 3rd base and homeplate and he is running 20 ft/sec toward home.

At what rate is the distance between Nelson and Kyle changing at this instant?

Appropriately indicate if this distance is increasing (positive rate) or decreasing (negative rate). (also give units).



6. (10 pts) A conical paper cup (shown) has a 6 cm diameter at the top and has a height of 9 cm. Water is pouring into the cup at a constant rate of $3 \text{ cm}^3/\text{second}$. How fast is the height of water in the cup rising at the moment when it is 2 cm high? Recall: The volume of a cone is $V = \frac{1}{3}\pi r^2 h$. (also give units).

