

Math 124 Online, Winter 2018, Midterm II

February 20, 2018

Name and Student Number _____

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.
- You can only use a Ti-30x IIS calculator. Unless otherwise stated, you have to give exact answers to questions. ($\frac{2\ln 3}{\pi}$ and $1/3$ are exact, 0.699 and 0.333 are approximations for the those numbers.)
- **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.** If you continue at the back of a page, make a note for me.

Question	points
1	
2	
3	
4	
Total	

1. Find $\frac{dy}{dx}$ for the following functions.

(a) (3 points) $y = \frac{\ln(x^2)}{e^{2x-7}}$

(b) (4 points) $y = \sin(\ln(x^3 + e^x))$

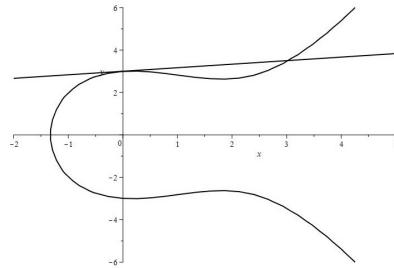
(c) (4 points) $y = x^{\ln x}$

2. The line is tangent to the curve

$$y^2 = x^3 - 3x^2 + x + 9$$

at the point $(0, 3)$ as shown.

- (a) (6 points) Find the x -coordinate of the second point where the tangent line intersects the curve. Use the graph as a guide. Do not estimate coordinates of points or slopes from the graph.



- (b) (3 points) The point $(a, 2.92)$ is on the curve. Estimate the value of a using linearization.

3. Answer the following questions about the parametric curve:

$$x = t^2 + 5t + 2 \quad y = t^3 - 3t + 1$$

(a) (4 points) At what points (x, y) is the tangent line horizontal?

(b) (6 points) For what values of t is $\frac{d^2y}{dx^2}$ positive?

4. (10 points) A tub is in the shape of an upside down cone with its tip cut off as shown below. The radius of the base is 0.8 meters and the radius of the top is 1.2 meters. The depth of the tub is 1.4 meters. Water is pumped into the tub at a rate of 0.07 cubic meters per second. How fast is the water level rising when the depth of the water measured at the center of the tub is 1.1 meters?

Hint: Complete the cone in the picture for volume computation.

