

Math 241

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Spring 2018

Name:

Student ID (last 6 digits): XXX-

MIDTERM 2

Version A

You have 50 minutes to complete the exam. Do all work on this exam, i.e., on the page of the respective assignment. Indicate clearly, when you continue your solution on the back of the page or another part of the exam.

Write your name and the last six digits of your student ID number on the top of this page. Check that no pages of your exam are missing. This exam has 7 questions and 9 printed pages (including this one and a page for scratch work in the end).

No calculators, books or notes are allowed on this exam!

Show all work! (Unless I say otherwise.) Correct answers without work will receive **zero**. Also, **points will be taken from messy solutions**.

Good luck!

Question	Max. Points	Score
1	15	
2	10	
3	15	
4	15	
5	15	
6	15	
7	15	
Total	100	

1) [15 points] Let $\vec{r}_1(t) = \langle t, t^2, t + 1 \rangle$ and $\vec{r}_2(t) = \langle \sqrt{t}, t, t - 1 \rangle$. Do these curves intersect? If so, in what point(s)?

[**Note:** I am *not* asking if they collide!]

2) [10 points] Let $\vec{r}(t) = \langle te^t, \cos(\pi t) \rangle$. Find a parametrization for the tangent line at the point given by $t = 0$.

3) [15 points] Compute the arc length of $\vec{r}(t) = \langle t^2, t^3 - 1 \rangle$ for $0 \leq t \leq 1$.

[**Note:** You can leave numerical computations indicated.]

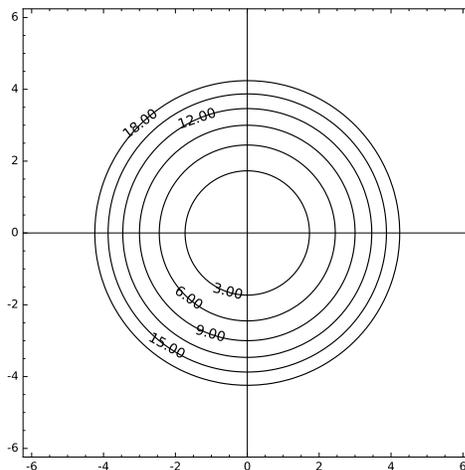
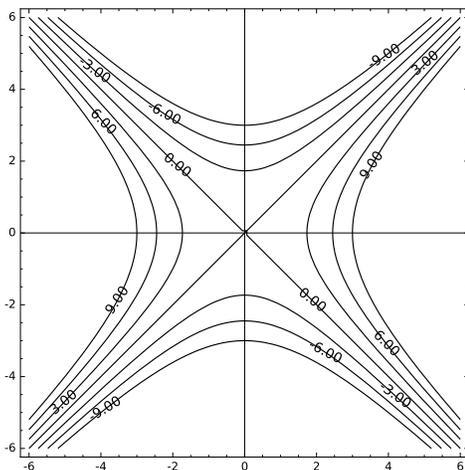
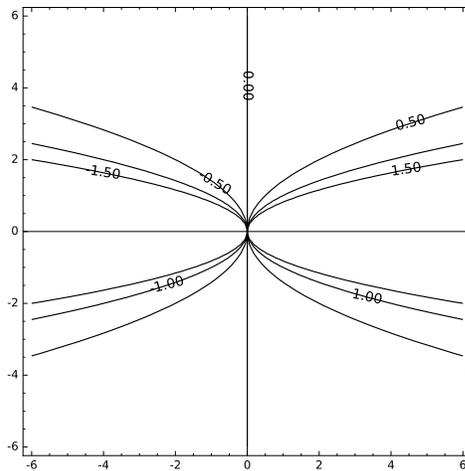
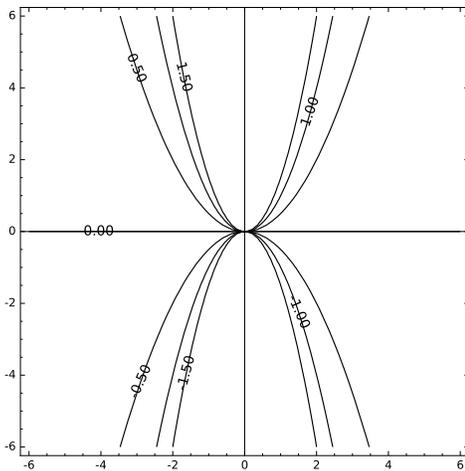
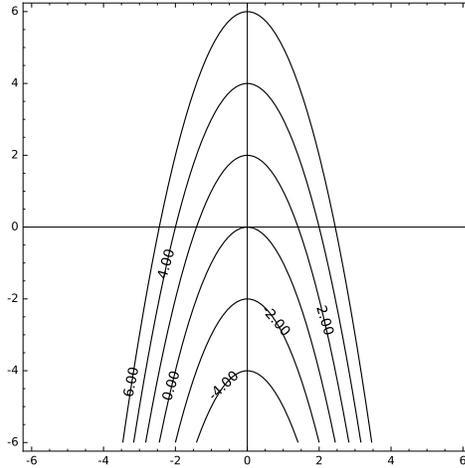
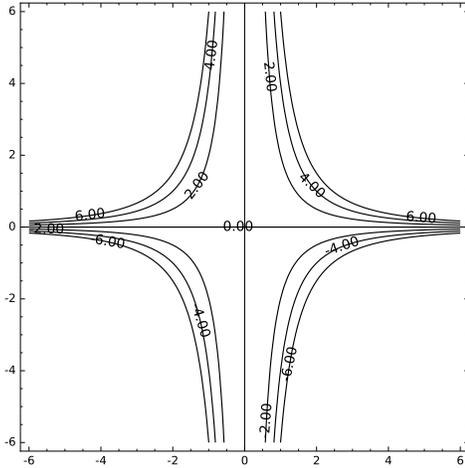
4) [15 points] Match the functions to their level curves by writing the corresponding letter inside the square containing the level curves. (Leave the level curves with no match unmarked.)

A: $f(x, y) = x^2 + y$

B: $f(x, y) = x/y^2$

C: $f(x, y) = x^2 y$

D: $f(x, y) = x^2 - y^2$



5) [15 points] Show that

$$\lim_{(x,y) \rightarrow (0,0)} \frac{xy - 2y^2}{x^2 + y^2}$$

does not exist.

[**Note:** You have to show your work *and* explain why your work shows that the limit does not exist.]

6) Compute:

(a) [5 points] $\lim_{(x,y) \rightarrow (1,2)} \frac{x^2 - y^3}{x + y}$

(b) [10 points] $\lim_{(x,y) \rightarrow (0,0)} \ln(1 + 2x^2 + y^2) \cdot \sin\left(\frac{1}{x^2 + y^2}\right)$

7) Let $f(x, y) = x^3 - xy^2 + y - 2$

(a) [5 points] Compute f_x and f_y .

(b) [5 points] Give the equation of the tangent plane for $(x, y) = (0, 0)$.

(c) [5 points] Use linear approximation to approximate $f(-0.1, 0.2)$.

Scratch: