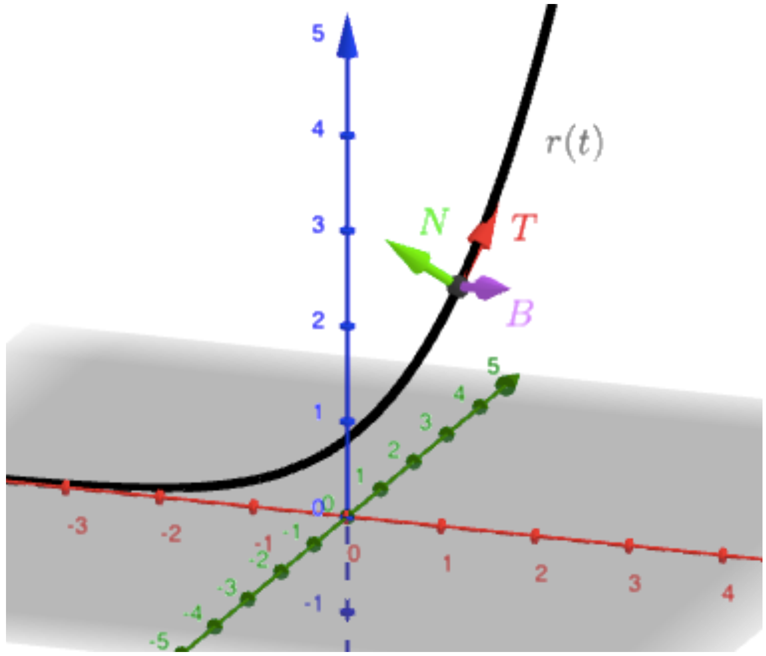
M110C Quiz#3 Spring 2022.

(There's a rubric at the bottom of pg 2.)

1. Here's the space curve shown on the right:

$\mathbf{r}(t) = < \ln(t),\, 2t,\, t^2 >$

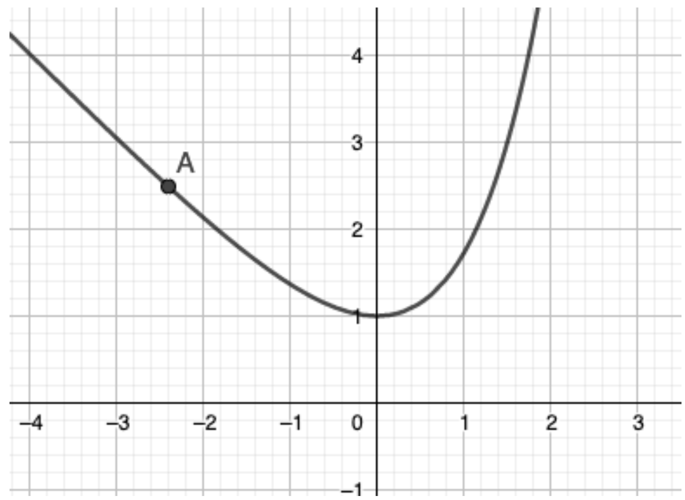


a) Compute $\mathbf{T}(t), \mathbf{N}(t), \mathbf{B}(t), \kappa(t), \tau(t)$ for this curve.

b) Find the osculating plane when $t = 1$.

c) What is the arc-length of this curve from $t = 1$ to $t = 2$?

2. Here's the planar curve shown on the right:
$\mathbf{r}(t) = < t,\, e^t - t,\, 0 >$

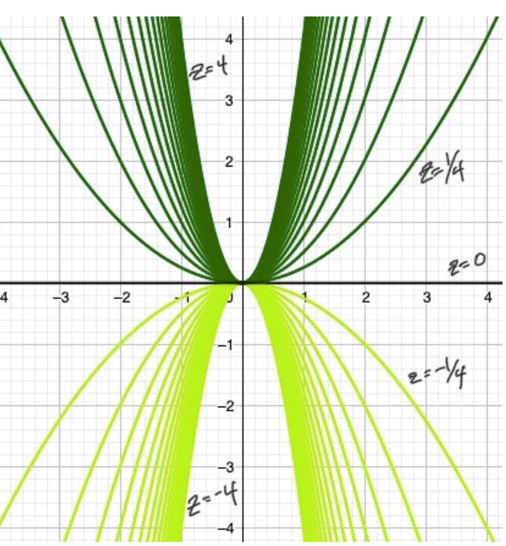


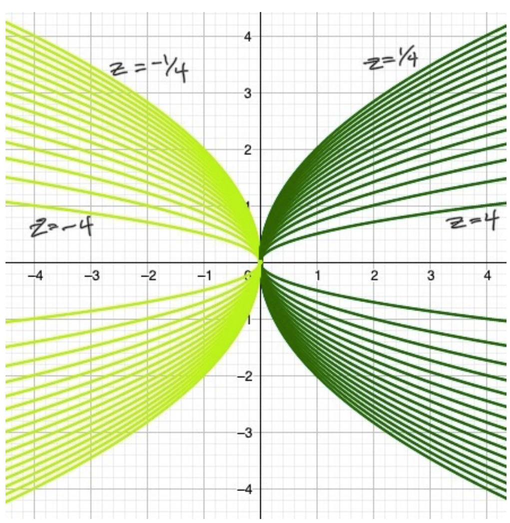
a) What are the tangential and normal components of acceleration, a_T and a_N, when $t = 0$?

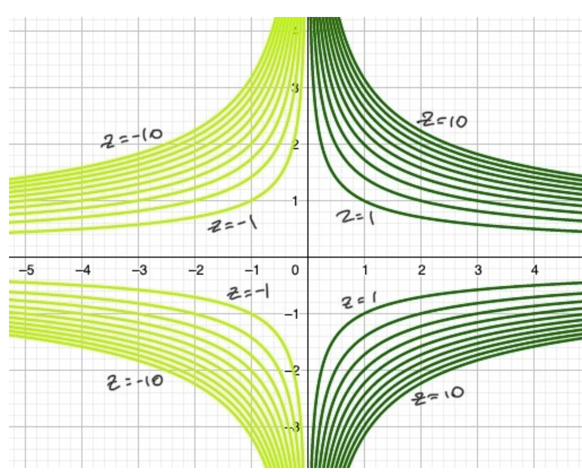
b) At what point on the curve does the largest curvature happen? What is the largest curvature? (hint: you'll need to set the derivative of something equal to 0.)

3. Below are some contour maps of three multivariable functions $z = f(x, y)$.
Match each of the contour maps to one of these given functions:

$$z = x^2 y, \quad z = xy^2, \quad z = \frac{x}{y^2}, \quad z = \frac{x^2}{y}, \quad z = \frac{y}{x^2}, \quad z = \frac{y^2}{x}$$



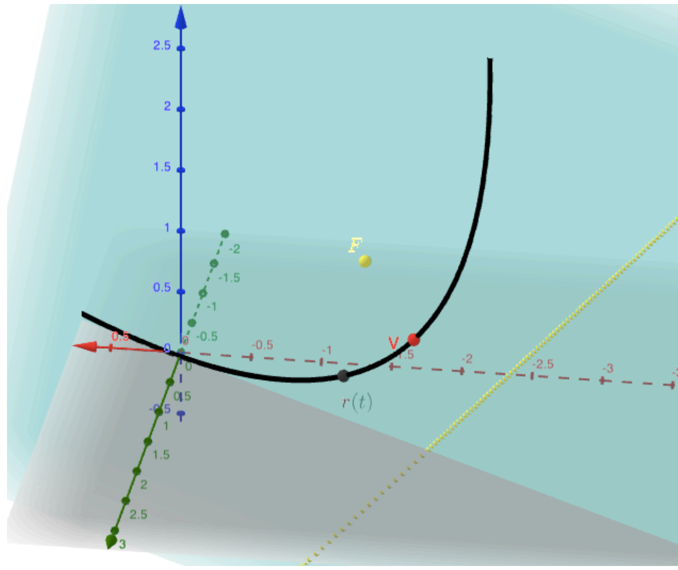




4. This question is optional extra credit. (1pt)

The space curve on the right has a parameterization

$$\mathbf{r}(t) = < t^2 + t - 2, \ -t^2 + 1, t^2 - 2t + 1 >$$



a) show that this is a planar curve, i.e. all the terminal points of the vector-valued function $\mathbf{r}(t)$ lie on a single plane.

b) Show that this curve is a parabola by finding its focal point F, vertex V, and directrix.

Quiz Rubric.
Show up to the quiz meeting: 4pts
Problem1: 3pts
Problem2: 2pts
Problem3: 1pt
Total possible: 10pts