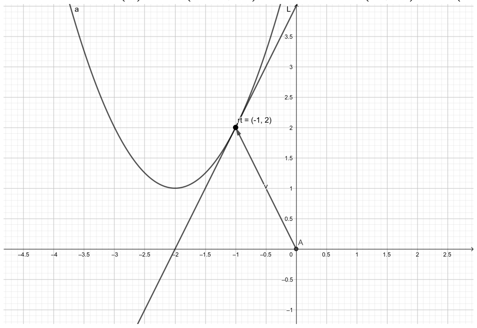
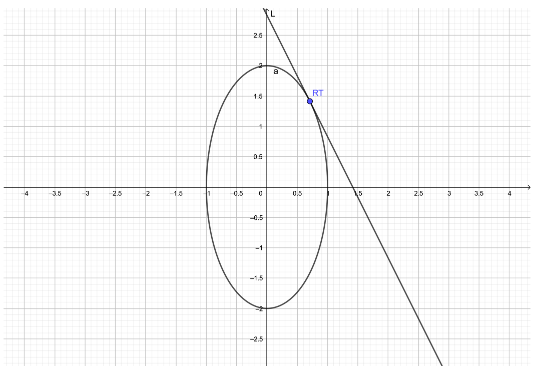
1. a) $r(t) = (t-2, t^2+1) \wedge (-2 \leq t \leq 2) \wedge (t = 1)$

   - $r'(t) = (1, 2t)$
   - $t = 1 \Rightarrow r(t) = (-1, 2) \wedge L = \lambda(1, 2) + (-1, 2)$



   b) $r(t) = (\sin(t), 2\cos(t)) \wedge (0 \leq t \leq 2\pi) \wedge (t = \frac{\pi}{4})$

   - $r'(t) = (\cos(t), -2\sin(t))$
   - $t = \frac{\pi}{4} \Rightarrow r(t) = (\frac{\sqrt{2}}{2}, \sqrt{2}) \wedge L = \lambda(\frac{\sqrt{2}}{2}, -\sqrt{2}) + (\frac{\sqrt{2}}{2}, \sqrt{2})$



2. a)
   - $\begin{cases} x(t) = 1 + 2\sqrt{t} \\ y(t) = -t \\ 0 \leq t \leq 9 \end{cases}$
   - $P = (3, -1)$

   $r(t) = (1 + 2\sqrt{t}, -t) \Rightarrow$

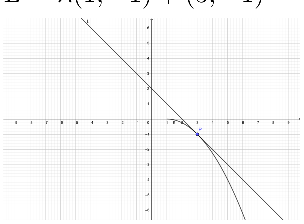
   $r(t) = (3, -1) \Leftrightarrow$

   $1 + 2\sqrt{t} = 3 \wedge -t = -1 \Leftrightarrow$

   $t = 1$

   $r'(t) = (\frac{1}{t}, -1) \Rightarrow$

   $L = \lambda(1, -1) + (3, -1)$



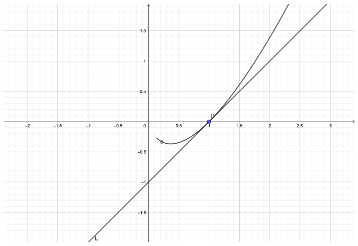
   b)
   - $\begin{cases} x(t) = e^t \\ y(t) = te^t \\ -2 \leq t \leq 3 \end{cases}$
   - $P = (1, 0)$

   $r(t) = (e^t, te^t) \Rightarrow$

   $r'(t) = (e^t, e^t + te^t)$

   $r(t) = (1, 0) \Leftrightarrow t = 0$

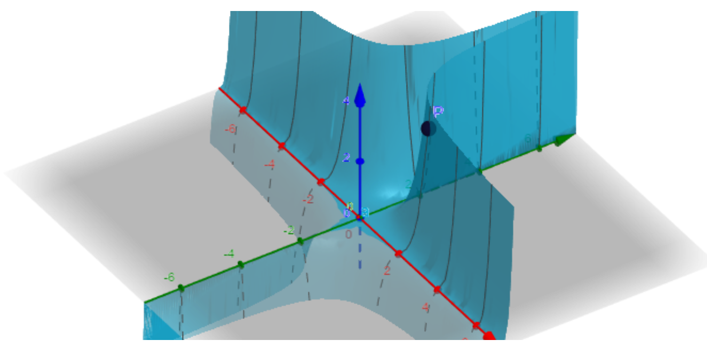
   $L = \lambda(1, 1) + (1, 0)$



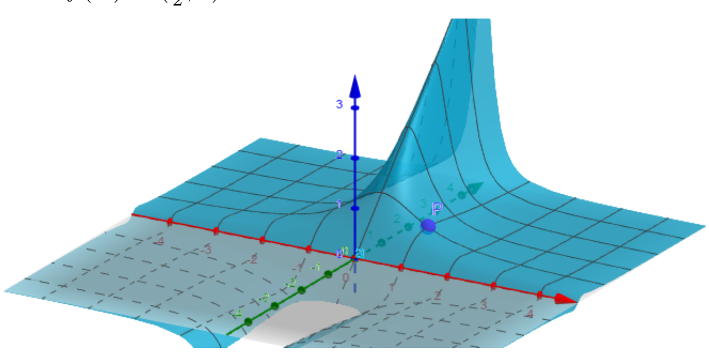
3. a) $r(t) = (te^{-t}, \tan(t), t^2 + t) \wedge t = 0$
   $r'(t) = (-e^{-t} + te^{-t}, \sec^2(t), 2t + 1)$
   $r(0) = (0, 0, 0)$
   $r'(0) = (-1, 1, 1)$
   $L = \lambda(-1, 1, 1)$

   b) $r(t) = (t^3 + 3t, t^2 + 1, 3t + 4) \wedge t = 0$
   $r'(t) = (3t^2 + 3, 2t, 3)$
   $r(0) = (0, 1, 4)$
   $r'(0) = (3, 0, 3)$
   $L = \lambda(3, 0, 3) + (0, 1, 4)$

4. a) $f(x, y) = x^2y^3 \wedge P = (2, 1)$
   - $f_x = 2y^3x$
   - $f_y = 3x^2y^2$
   - $\nabla f(P) = (4, 12)$



   b) $f(x, y) = \frac{y}{1+x^2y^2} \wedge P = (1, 1)$
   - $f_x = \frac{2xy^3}{(x^2y^2+1)^2}$
   - $f_y = \frac{1-x^2y^2}{(x^2y^2+1)^2}$
   - $\nabla f(P) = (\frac{1}{2}, 0)$



5. a) $f(x, y) = x^4 + 2xy + y^3x - 1$
   - $f_x = 4x^3 + 2y + y^3$

- $f_y = 2x + 3xy^2$

b) $f(x, y) = \sin(x)$
- $f_x = \cos(x)$
- $f_y = 0$

c) $f(x, y) = x^2 \sin^2(y)$
- $f_x = 2x \sin^2(y)$
- $f_y = 2x^2 \sin(y) \cos(y)$

d) $f(x, y) = xe^{x^2+y^2}$
- $f_x = e^{x^2+y^2} + x(2x)e^{x^2+y^2}$
- $f_y = x(2y)e^{x^2+y^2}$

e) $f(x, y, z) = ye^x + z$
- $f_x = ye^x$
- $f_y = e^x$
- $f_z = 1$

6. a) No existe ya que tiene picos

   b) Los limites no existen, ya que por izquirda dan -1 y por derecha 1

7. a) $f(x, y) = x^3y^5 + 2x^4y$
- $f_x = 3x^2y^5 + 8x^3y$
- $f_{xx} = 6xy^5 + 24x^2y$
- $f_{xy} = 15x^2y^4 + 8x^3$
- $f_y = x^35y^4 + 2x^4$
- $f_{yy} = 20x^3y^3$
- $f_{yx} = 15x^2y^4 + 8x^3$

b) $f(x, y) = \sin^2(x + y)$
- $f_x = 2\sin(x + y) \cos(x + y)$
- $f_{xx} = -2\sin^2(x + y) + 2\cos^2(x + y)$
- $f_{xy} = -2\sin^2(x + y) + 2\cos^2(x + y)$
- $f_y = 2\sin(x + y) \cos(x + y)$
- $f_{yy} = -2\sin^2(x + y) + 2\cos^2(x + y)$
- $f_{yx} = -2\sin^2(x + y) + 2\cos^2(x + y)$

c) $f(x, y) = \sqrt{x^2 + y^2}$
- $f_x = \frac{x}{\sqrt{x^2+y^2}}$
- $f_{xx} = \frac{y^2}{(x^2+y^2)^{\frac{3}{2}}}$
- $f_{xy} = \frac{xy}{(x^2+y^2)^{\frac{3}{2}}}$
- $f_y = \frac{y}{\sqrt{x^2+y^2}}$
- $f_{yy} = \frac{x^2}{(x^2+y^2)^{\frac{3}{2}}}$
- $f_{yx} = \frac{xy}{(x^2+y^2)^{\frac{3}{2}}}$

d) $f(x, y) = \frac{xy}{x-y}$
- $f_x = \frac{y^2}{(x-y)^2}$
- $f_{xx} = \frac{-2y^2}{(x-y)^3}$
- $f_{xy} = \frac{-2yx}{(x-y)^3}$
- $f_y = \frac{x^2}{(x-y)^2}$

- $f_{yy} = \frac{2x^2}{(x-y)^3}$
- $f_{yx} = \frac{-2yx}{(x-y)^3}$

8.