

TeX code compiled with `\documentclass{beamer}` using the Amsterdam theme.

There are four png images needed to compile slides:

contour1.png

contour2.png

astroid.png

lemniscate.png


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\begin{document} \begin{frame} \large Draw a graph of  $x=\sin y$  and find the slope of the line tangent to the
graph at the point  $(0,\pi)$ . \vskip 45pt Find  $dx/dy$  and  $dy/dx$  if  $y\sec(x) = 6x\tan(y)$ . \end{frame}
\begin{frame} \large Find  $dy/dx$  by implicit differentiation. \vskip 15pt \begin{columns}
\begin{column}{0.5\textwidth} \begin{enumerate} \item[\bf a)]  $x^4+y^3=1$  \vskip 30pt \item[\bf b)]  $7x^2 +
5xy - y^2 = 6$  \vskip 30pt \item[\bf c)]  $x^7(x + y) = y^2(4x + y)$  \end{enumerate} \end{column}
\begin{column}{0.5\textwidth} \begin{enumerate} \item[\bf d)]  $4 \cos(x) \sin(y) = 2$  \vskip 30pt \item[\bf e)]
 $5y\sin(x^2) = 9x\sin(y^2)$  \vskip 30pt \item[\bf f)]  $\sqrt{7x+y}=6+x^2y^2$  \end{enumerate} \end{column}
\end{columns} \end{frame} \begin{frame} \large Explain (without calculating) why the two following equations will
yield the same formula for  $dy/dx$ . Does this mean that the two graphs will have exactly the same tangent lines?
 $x^3y+y^2+y=1$   $x^3y+y^2+y=-1$  \begin{columns} \begin{column}{0.5\textwidth}
\includegraphics[height=5cm]{contour1.png} \end{column} \begin{column}{0.5\textwidth}
\includegraphics[height=5cm]{contour2.png} \end{column} \end{columns} \end{frame} \begin{frame} \large
Find an equation of the tangent line to the ellipse  $9x^2 + xy + 9y^2 = 19$  at the point  $(1, 1)$ . \vskip 20pt
Find an equation of the tangent line to the astroid  $x^{2/3}+y^{2/3} = 4$  at  $(-\sqrt[3]{3},1)$ .
\begin{center} \includegraphics[height=4cm]{astroid.png} \end{center} \end{frame} \begin{frame} \large Find
the points on the lemniscate  $8(x^2+y^2)^2=25(x^2-y^2)$  where the tangent is horizontal.
\begin{figure}[htp] \centering{ \includegraphics[height=4cm]{lemniscate.png} } \end{figure} \end{frame}
\begin{frame} \large If  $f(x) + x^2[f(x)]^3 = 10$  and  $f(1) = 2$ , find  $f'(1)$ . \vskip 50pt Find  $dx/dy$  and
 $dy/dx$  and  $dz/dx$  if  $y\sec(z) = 6x\tan(y)$ . \end{frame} \begin{frame} \large Find  $y''$  by implicit
differentiation.  $4x^2+y^2=9$  \end{frame} \begin{frame} \large When we introduced the Power Rule, we
explained it for  $y=x^n$  when  $n$  is a nonnegative integer, and we promised that later we'd explain it when  $n$ 
is a rational and/or negative number. The moment has come. In the following, you should use the Power Rule only
for  $n$  a nonnegative integer to prove it the Power Rule for all rational numbers. \begin{enumerate}[a)]
\item Warm-up: write  $y=x^{\frac{2}{3}}$  as  $y^3=x^2$ . Then use Implicit Differentiation to show
 $y'=\frac{2}{3}x^{-\frac{1}{3}}$ . \item Let  $y=x^{\frac{p}{q}}$ , where  $p$  and  $q$  are positive integers. Use
the same method as the previous problem to show  $y'=\frac{p}{q}x^{\frac{p}{q}-1}$ . \item Warm-up: write
 $y=x^{-1}$  as  $xy=1$ . Then use Implicit Differentiation to show  $y'=-x^{-2}$ . \item Let  $y=x^{-a}$ , where  $a$ 
is a positive rational number. Use the same method as the previous problem to show  $y'=-ax^{-a-1}$ .
\end{enumerate} \end{frame} \begin{frame} \large When you solve for  $y'$  in an implicit differentiation problem,
you have to solve a quadratic equation \begin{enumerate} \item always \item sometimes \item never
\end{enumerate} \end{frame} \begin{frame} \large Find equations of both the tangent lines to the ellipse  $x^2
+ 9y^2 = 81$  that pass through the point  $(27, 3)$ . \end{frame} \begin{frame} \large The Thin Lens Equation in
optics relates the focal length  $f$  of a lens, the distance  $a$  from an object to the lens, and the distance  $b$  from
the object's image to the lens. The equation is  $\frac{1}{a}+\frac{1}{b}=\frac{1}{f}$  Let's say you have a
lens with focal length  $10$  cm. \begin{itemize} \item[\bf (a)] Which of the following derivatives describes the rate
at which the position of the image changes as you move the object? \centerline{  $\frac{da}{db}$   $\frac{db}{da}$   $\frac{da}{df}$   $\frac{df}{da}$  } \item[\bf (b)] If the object is 20 centimeters

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from the lens and moving away from the lens, where is the object's image and in what direction is it moving?

From:  
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