Mathematica Labs | Denis Shubleka

Subject: Calculus

Topic: Derivatives Graphically

Goal: Use the Manipulate command to visualize the derivative as a function

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Task 1

The interactive window shows that as h approaches zero, the graph of the
quotient approaches that of -Sin[x], verifying that the derivative of Cos[x]
is -Sin[x]. Feel free to alter the expression below using another function.

```
Manipulate[Plot[{(Cos[x + h] - Cos[x])/h, -Sin[x]}, {x, -2 π, 2 π}], {h, 1, 0.01}]
```

Now we plot y=2^x and its tangent line at the point (1, 2), and zoom in
closely at (1,2). What do you notice?

```
f[x_] := 2^x;
Manipulate[Plot[{f[x], f'[1] * (x - 1) + f[1]}, {x, 1 - m, 1 + m},
  Frame → True, Axes → False, Epilog → {Red, Point[{1, 2}]},
  GridLines → {Range[0, 3, 0.05], Range[-1, 10, 0.2]}, GridLinesStyle → Gray,
  FrameTicks → None, Filling → {1 → {2}}], {{m, 1, "zoom"}, 1, 0.1}]
```

Related Exercises/Notes:
