

You should be familiar with at least two forms of the equation of a straight line:

Slope-intercept form: $y = mx + b$, where m is the slope and b is the y -intercept
(Equation 2-9 on page 34)

Advantage: easy to graph on the calculator since y is given as a function of x

Disadvantage: does not include vertical lines, for which slope is undefined.

General form: $Ax + By = C$, where A and B are not both equal to zero.

(Equation 2-10 on page 34)

Advantage: includes all lines including special cases of lines parallel to the x -axis ($A = 0$) and parallel to the y -axis ($B = 0$).

Disadvantage: to graph on the calculator, you must first solve for y in terms of x .

There is a third form for the equation of a line that is used frequently in calculus and analytic geometry, the “point-slope” form.

Point-slope form: $y - y_1 = m(x - x_1)$, where m is the slope and (x_1, y_1) is one point on the line.

(Equation 2-6 on page 32)

Advantage: you can quickly get an equation if you know one point and the slope or if you know two points. (See Examples 1 & 2, pages 32 and 33)

Disadvantage: to graph on the calculator, you must first solve for y in terms of x .

We have found derivatives and know that they represent slopes of lines tangent to curves at given points. We may now use the point-slope form of the equation of a line to find the **equation** of a tangent line. See Example 1 on page 11.

Two lines that are **perpendicular** to each other have slopes that are **opposite reciprocals**, that is if the slopes are m_1 and m_2 , then $m_2 = -\frac{1}{m_1}$ or $m_1 m_2 = -1$. (Equation 2-5, page 30)

The line perpendicular to a tangent line at a point on a curve is called the **normal** to the curve at that point. To find the equation of the normal, first use the opposite reciprocal property to find the slope; then use the point-slope form to get the equation.

Study Examples 3 and 4 on page 118.

In Example 5 on page 119, we don't know the point on the curve but we do know the slope of the normal line. The equation of the parabola is $4y = x^2$ or $y = \frac{1}{4}x^2$. Therefore $\frac{dy}{dx} = \frac{1}{2}x$.

Since the slope of the normal line is -1 , the slope of the tangent line is the opposite reciprocal, that is 1 . So $\frac{dy}{dx} = 1$, from which it follows that $x = 2$ and the point in question is $(2,1)$. We then use the point-slope form to find the equation of the normal: $y - 1 = -1(x - 2)$. In slope-intercept form, this equation becomes $y = -x + 3$.

Exercises:

Page 36: 1, 3, 13, 21, 25

Pages 119-120: 1, 3, 5, 7, 9, 13, 15, 23