

Find the slopes and y -intercepts of the following lines.

1. $y = \frac{2x - 1}{5}$

2. $-5y + 2x = 9$

3. $y = \frac{3}{5}$

Find the equations of the following lines:

4. Slope is $\frac{1}{2}$; passing through the origin.

5. Slope is $-\frac{1}{3}$; $(2, -3)$ on line.

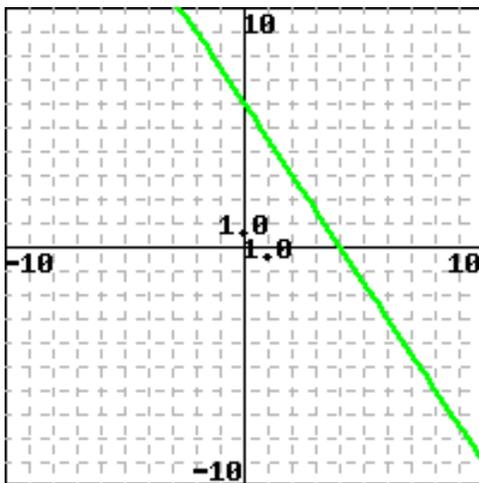
6. $(5, -3)$ and $(-1, 3)$ on line.

7. Find the equation of the line in slope-intercept form given the line passes through the point $(4, 5)$ and is perpendicular to the line $y = 8x + 3$.

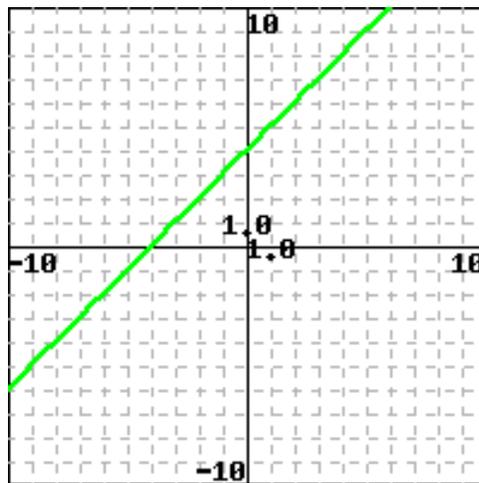
8. Find the equation of the line in slope-intercept form given the line passes through the point $(-6, 7)$ and is parallel to the line $y = 3x - 2$. Also, find the perpendicular line passing through the same point.

9. Find the equation of the line in slope-intercept form given the line passes through the points $(-5, 8)$ and $(2, -6)$. Also, find the line perpendicular to this line passing through the origin.

10. Find an equation $y = mx + b$ for the line whose graph is sketched below to the left.



Problem 10



Problem 11

11. Find an equation $y = mx + b$ for the line whose graph is sketched above to the right.

12. The independent variable is usually the causative variable. Since the rate of chirping of the crickets, N , is determined by the temperature, T , the independent variable should be the temperature. The Dolbear equation is given by

$$T = \frac{N}{4} + 40.$$

Find the linear cricket equation with N depending on T . This is also known as the inverse equation.

13. Most of the world uses the metric system. Convert the following scenario into one that someone from a metric based country could better understand. Its a beautiful morning with a temperature of 75°F. We travel 5 miles to a beautiful place to take a dive. The water temperature is 65°F with a breeze of 15 miles per hour. We swim 400 yards out to our dive spot where we submerge to a depth of 50 feet. Among the animals that we see are 5 inch abalone, 14 inch lobsters, 2 inch banded gobies, and a 4 foot leopard shark. At the end of the dive we surface 150 yards from shore in 15 feet of water. My tank gauge registers 700 psi (pounds per square inch) of air remaining. (Note that metric countries often use SCUBA gauges in kg/square cm.)

14. The lecture notes gave the average heights of five and seven year olds as 108 cm and 121 cm, respectively. Use these data to estimate the average height of a six year old. What is the average rate of growth for children these ages in cm/yr?

15. The lecture notes showed the average height of a child satisfies the equation:

$$h = 6.46a + 72.3,$$

where h is the height and a in the age of the child. Find the average height of a six year old using this equation. Is this estimate better or worse than the estimate in Problem 14 and why?

16. Use the equation in Problem 15 for height of a child. If your daughter is 135 cm at age nine, then what does the model predict her height to be at age ten? If she is 160 cm at age 13, then what does the model predict her height to be at age 15? Which of these estimates is better and why?

17. For a range of values, the absorbance A read from a spectrophotometer varies linearly with the concentration of nickel (II), N . (The measurement is made for the red-colored nickel dimethylglyoximate at 366 nm.) If the spectrophotometer is not carefully calibrated to zero for the reference signal, then one needs to use the formula

$$A = kN + b,$$

for some constants k and b .

a. Suppose that a sample with 0.02 mg/ml of nickel (II) gives an absorbance of 0.26 and one with 0.04 mg/ml of nickel (II) gives an absorbance of 0.44. Find the values for k and b .

b. Find the absorbance for a sample with 0.035 mg/ml of nickel (II).

c. Find how much nickel (II) is in a sample that gives an absorbance of 0.31.

18. For a gas kept at a constant volume, the pressure P depends linearly on temperature T . Thus, we can write the equation

$$P = kT + b,$$

for some constants k and b .

a. Suppose we run an experiment and find that when $T = 0^\circ\text{C}$, the pressure $P = 760$ mm of Hg. Then when $T = 100^\circ\text{C}$, the pressure $P = 1040$ mm of Hg. Find the constants k and b for the equation above.

b. Absolute zero can be approximated finding where the pressure $P = 0$. Find the temperature in $^\circ\text{C}$ for absolute zero from the data points (and the equation above).

19. The level of CO_2 in parts per million (ppm) at Mauna Loa Observatory was found to be 325.3 in 1970 and 338.5 in 1980. Assume the level of CO_2 is linear for some range of dates.

a. Find the equation of the line giving the concentration of CO_2 as a function of the date. Put this equation in slope-intercept form. (Use the date for the independent variable.)

b. Use this equation to estimate the level of CO_2 in 2000 and 1950. Does the model make sense for predicting the level of CO_2 at the time of the Plymouth colony in 1620?

20. Data show that the improvement in running events has been almost linear over the last century. John Paul Jones (USA) held the world record for the mile in 1913 with a time of 4:14.4 (254.4 sec). More recently, Sebastian Coe (Great Britain) set the world record in 1979 with a time of 3:49.0 (229.0 sec).

a. Find the equation of the line giving the world record time (in sec) as a function of the date. Put this equation in slope-intercept form.

b. Use this equation to estimate when the 4 minute mile occurred. (It was actually broken by Roger Bannister in 1954 with a time of 3:59.4).

c. Use your line to predict the world record time of the mile in the year 2000. Give your time in minutes and seconds.