

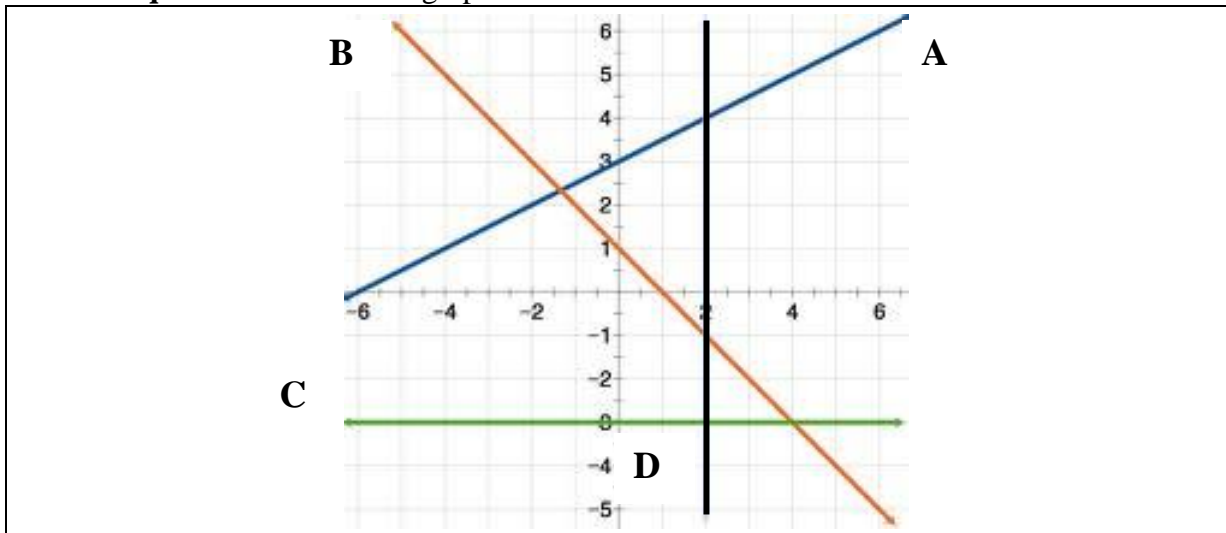
**#1 Lines**

Linear functions exhibit a **constant rate of change** which is the **slope**:  $m = \frac{y_2 - y_1}{x_2 - x_1}$ .

Different forms of a linear function:  $\begin{cases} \text{slope-intercept: } f(x) = mx + b \\ \text{point-slope: } y - y_1 = m(x - x_1) \\ \text{standard: } Ax + By = C \end{cases}$

Special Lines:  $\begin{cases} \text{Horizontal: } y = b; m = 0 \\ \text{Vertical: } x = a; m \text{ is undefined} \\ \text{Parallel: slopes are equal} \\ \text{Perpendicular: slopes are negative reciprocals} \end{cases}$

1) Write an **equation** for each line graphed below.



**Find the equation of the line in slope-intercept form ( $y = mx + b$ ) and standard form ( $Ax + By = C$ ).**

**You might have to use point-slope first ( $y - y_1 = m(x - x_1)$ ).**

2) A line through points A(-3, 7) and B(1, -3).

4) A line through the point D(-4, 2) and perpendicular to  $y = -4x + 1$ .

3) A line through the point C(5, -2) and parallel to  $y = -\frac{1}{3}x + 4$ .

5) Explain why the slope of a vertical line is undefined.

6) A certain stock starts out at \$50 per share at the opening of the market and is increasing linearly at a rate of \$3 per hour. (A) Write an equation representing the Value (V) of the stock, as a function of hours,  $h$ , that the market has been open. (B) What is the stock's value after 5.5 hours?

7) A gym membership with two personal training sessions costs \$125, while gym membership with 5 personal training sessions costs \$260. What is the rate for personal training sessions?

**#2 Factoring**

Factoring is the process of rewriting a mathematical expression so as the product of individual expressions called “factors.”

Factor completely. If the expression has no real factors, write NRF.

8)  $16 - (x+2)^2$

9)  $10x^2 + 23x + 12$

10)  $2x^3 - 3x^2 + 2x - 3$

11)  $4y^3 - 20y^2 + 25y$

12)  $3x^4 + 24x$

13)  $64x^3 - 27$

14)  $x^4 - 81$

15)  $y^2 + 25$

16)  $8x^3 - 18x$

**#3 Working with Exponents**

Simplify each expression below keeping exponents positive.

17)  $\frac{(4x^3y^{-2})^3}{32x^7y^{-9}}$

18)  $\frac{(24x^{-4}y^5)^{-2}}{(36x^{-6}y^{17})^{-1}}$

19)  $\left(\frac{9x^4y^6}{4z^{14}}\right)^{3/2}$

**#5 Solving Equations**

An equation is “solved” when one has found all values that satisfy the condition set forth in the original equality.

Solve.

20)  $2(x-3) + 3(5-x) = 4$

21)  $\frac{1}{2}(4x-10) = -13$

22)  $\frac{2x-7}{3} = \frac{3-x}{4}$

23)  $2|5x+2| - 1 = 5$

24)  $\sqrt{7-x} = x-5$

25)  $\sqrt{3-x} - x = 3$

Solve by factoring or using the quadratic formula.

26)  $4x^2 + 7 = 12x$

27)  $3x^2 = 8x + 12$

28)  $3x^2 + 6 = 10x$

29)  $3x^3 + 4x^2 - 9x - 12 = 0$

30)  $5x^2 + 7x - 7 = 3x^2 + 11x + 2$

**#6 Quadratic Functions**

Any function that can be written in the form  $f(x) = ax^2 + bx + c$  or  $f(x) = a(x-h)^2 + k$  is a quadratic function.

Graph each quadratic function identifying its vertex, axis of symmetry, y-intercept and mirror point, and maximum/minimum value.

31)  $y = 2(x+3)^2 - 4$

32)  $f(x) = 3x^2 + 12x + 9$

33)  $y = -2x^2 + 4x + 1$

**ANSWERS:**

<p>1a) <math>y = \frac{1}{2}x + 3</math></p> <p>b) <math>y = -x + 1</math></p> <p>c) <math>y = -3</math></p> <p>d) <math>x = 2</math></p> <p>2) <math>y - 7 = \frac{-5}{2}(x + 3)</math></p> <p><math>5x + 2y = -1</math></p> <p><math>y = \frac{-5}{2}x - \frac{1}{2}</math></p>	<p>3) <math>y + 2 = \frac{-1}{3}(x - 5)</math></p> <p><math>x + 3y = -1</math></p> <p><math>y = \frac{-1}{3}x - \frac{1}{3}</math></p> <p>4) <math>y - 2 = \frac{1}{4}(x + 4)</math></p> <p><math>x - 4y = -12</math></p> <p><math>y = \frac{1}{4}x + 3</math></p> <p>5) Vertical lines: <math>m = \frac{y_2 - y_1}{0}</math></p>	<p>6a) <math>V = 3h + 50</math></p> <p>b) \$65.50</p> <p>7) \$45</p> <p>8) <math>(2 - x)(x + 6)</math></p> <p>9) <math>(5x + 4)(2x + 3)</math></p> <p>10) <math>(x^2 + 1)(2x - 3)</math></p> <p>11) <math>y(2y - 5)^2</math></p> <p>12) <math>3x(x + 2)(x^2 - 2x + 4)</math></p> <p>13) <math>(4x - 3)(16x^2 + 12x + 9)</math></p>
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<p>14) <math>(x - 3)(x + 3)(x^2 + 9)</math></p> <p>15) NRF</p> <p>16) <math>2x(2x - 3)(2x + 3)</math></p> <p>17) <math>2x^2y^3</math></p> <p>18) <math>\frac{x^2y^7}{16}</math></p> <p>19) <math>\frac{27x^6y^9}{8z^{21}}</math></p>	<p>20) 5</p> <p>21) -4</p> <p>22) <math>\frac{37}{11}</math></p> <p>23) <math>-1, \frac{1}{5}</math></p> <p>24) 6</p> <p>25) -1</p> <p>26) <math>\frac{3 \pm \sqrt{2}}{2}</math></p>	<p>27) <math>\frac{4 \pm 2\sqrt{13}}{3}</math></p> <p>28) <math>\frac{5 \pm \sqrt{7}}{3}</math></p> <p>29) <math>\pm\sqrt{3}, -\frac{4}{3}</math></p> <p>30) <math>\frac{2 \pm \sqrt{22}}{2}</math></p>
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