

List 0*Algebra review*

1. Which of the following are true for all real values of the variables (or, at least, all real values for which both sides of the equation are defined)?

(a) $2x = x + x$ True

(b) $2(x + y) = 2x + y$ False

(c) $(x - y)^2 = x^2 - 2xy + y^2$ True

(d) $\frac{6 + a}{2} = 3 + \frac{a}{2}$ True

(e) $-(y + 2) = -y + 2$ False

(f) $-(a + b)^2 = (-a + b)^2$ False

(g) $x^3 + 3x = x + x$ False

(h) $k^{-2} = \frac{1}{k^2}$ True

(i) $x^{a+2} = x^a \times x^2$ True

(j) $\sqrt{a + b} = \sqrt{a} + \sqrt{b}$ False

(k) $\sqrt{a \cdot b} = \sqrt{a} \cdot \sqrt{b}$ True for non-negative numbers. If $a < 0$ or $b < 0$ or both, then this involves complex numbers, which are not part of this course.

(l) $\log(a + b) = \log(a) + \log(b)$ False

(m) $\log(a \cdot b) = \log(a) + \log(b)$ True for positive numbers.

(n) $\log(a \cdot b) = \log(a) \cdot \log(b)$ False

2. Compute the following values:

(a) $\cos(30^\circ) = \frac{\sqrt{3}}{2}$

(b) $\cos(45^\circ) = \frac{1}{\sqrt{2}}$ or $\frac{\sqrt{2}}{2}$

(c) $\cos(60^\circ) = \frac{1}{2}$

(d) $\cos(\pi/3) = \frac{1}{2}$ (same as previous)

(e) $\cos(\pi/2) = 0$

(f) $\sin(8\pi/3) = \frac{\sqrt{3}}{2}$

(g) $\sqrt{10000} = 100$

(h) $10000^{1/2} = 100$ (same as previous)

(i) $\sqrt[4]{10000} = 10$

(j) $625^{-1/2} = \frac{1}{25}$

(k) $\log_7(49) = 2$

$$(\ell) \log_4(1024) = \boxed{5}$$

$$(m) \log_9(3) = \boxed{1/2}$$

$$(n) \log_k(1) = \boxed{0}$$

$$(o) \ln(1) = \boxed{0}$$

$$(p) \ln(\sqrt{e}) = \boxed{1/2}$$

$$(q) \log_4(16^3) = \boxed{6}$$

3. Re-write $\frac{x^4}{\sqrt{x^{13}}}$ in the form x^\square . $\boxed{x^{-5/2}}$ (That box is not a mistake in the file.)

4. Re-write each of the following in the form $\square x^\square$, or state that this is not possible. You can assume $x > 0$ if necessary.

$$(a) x^3 \cdot x^7 = \boxed{x^{10}}$$

$$(b) x^3 x^7 = \boxed{x^{10}} \text{ (same as previous)}$$

$$(c) x^3 + x^7 \text{ not possible}$$

$$(d) x^3 - x^7 \text{ not possible}$$

$$(e) x^3/x^7 = \boxed{x^{-4}}$$

$$(f) \frac{x^3}{x^7} = \boxed{x^{-4}} \text{ (same as previous)}$$

$$(g) (x^3)^7 = \boxed{x^{21}}$$

$$(h) 3x^5 + (x^5)^2 \text{ not possible}$$

$$(i) 3x^{10} + (x^5)^2 = \boxed{4x^{10}}$$

$$(j) \sqrt{x^4} = \boxed{x^2}$$

$$(k) \sqrt{x^6 + x^4} \text{ not possible}$$

$$(l) \sqrt{x^6} + 8x^3 = \boxed{9x^3}$$

$$(m) x^3 \cdot \sqrt[3]{x} = \boxed{x^{10/3}}$$

$$(n) \ln(e^x) = \boxed{x}$$

$$(o) \ln(e^{6x}) = \boxed{6x}$$

$$(p) e^{9\ln(x)} = \boxed{x^9}$$

$$(q) e^{9\ln(x)+1} = \boxed{e x^9}$$

$$(r) e^{9\ln(x)} + 1 \text{ not possible}$$

$$(s) \frac{\sqrt{4e^{\ln(9x)+10}}}{e^5} = \boxed{6 x^{1/2}}$$

5. Re-write $\log_{10}(2^9)$ using the natural logarithm (\ln). $\frac{\ln(512)}{\ln(10)}$ or $\boxed{\frac{9 \ln(2)}{\ln(10)}}$

6. Expand each of the following:

(a) $(a - b)^2 = a^3 - 2ab + b^2$

(b) $(1 + x)^2 = 1 + 2x + x^2$

(c) $(2 - x)^3 = 8 - 12x + 6x^2 - x^3$

(d) $(6 + h)^3 = 216 + 108h + 18h^2 + h^3$

7. Simplify $\frac{(6 + h)^3 - 216}{h}$ if $h \neq 0$. $108 + 18h + h^2$

8. If a point on the line

$$y = -\frac{1}{3}(x - 6) + 8$$

has an x -value of 15, what is its y -value? 5

9. If a point on the line

$$y = -\frac{1}{3}(x - 6) + 8$$

has an x -value of 6, what is its y -value? 8

10. Graph each of the following:

(a) $y = 3(x - 1) + 2$

(b) $y = 3x - 1$

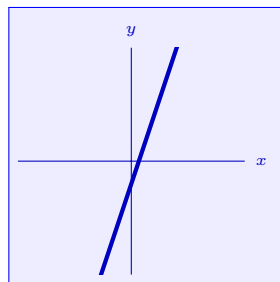
(c) $y - 2 = 3(x - 1)$

(d) $y + 1 = 3x$

(e) $3x - y = 1$

(f) $x = (y + 1)/3$

They are all the same!



11. Give an example of a point that is on the line

$$y - 17 = 38(x - 12).$$

There are literally infinitely many correct answers. The easiest to find is $(12, 17)$ because those numbers occur in the equation in such a way that

$$\underline{17} - 17 = 38(\underline{12} - 12).$$

12. Describe the shape of $y = 7$ in words. horizontal line

Describe $x = -2$ in words. vertical line

13. Give an equation for the line through the point $(-6, 5)$ with slope 2.

$y = 5 + 2(x + 6)$ or $y = 2x + 17$

14. Give an equation for each of the following:

(a) the line through $(1, 3)$ with slope 5. $y = 3 + 5(x - 1)$ or $y = 5x - 2$

(b) the line through $(0, -9)$ with slope $\frac{2}{5}$. $y = \frac{2}{5}x - 9$

(c) the line through $(-4.2, 6.1)$ with slope 8.88. $y = 6.1 + 8.88(x + 4.2)$
or $y = 8.88x + 43.396$

(d) the line through $(5, 1)$ with slope -3 . $y = 1 - 3(x - 5)$ or $y = -3x + 16$

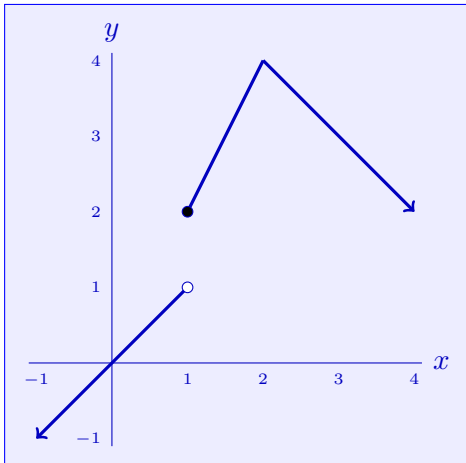
15. A line passes through both $(4, 4)$ and $(8, 2)$. What is its slope? $-1/2$

16. Give an equation for the line through $(1, 7)$ and $(10, -6)$.

$y = 7 - \frac{13}{9}(x - 1)$ or $y = -6 - \frac{13}{9}(x - 10)$ or $y = -\frac{1}{3}x + \frac{76}{9}$

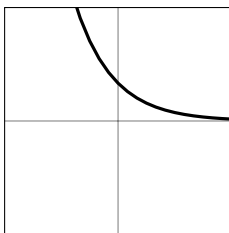
17. For $f(x) = \begin{cases} x + 1 & \text{if } x < 4 \\ x^2 & \text{if } x \geq 4 \end{cases}$, what is the value of $f(4)$? $4^2 = 16$

18. Draw a graph of the piecewise function $\begin{cases} x & \text{if } x < 1 \\ 2x & \text{if } 1 \leq x \leq 2 \\ 6 - x & \text{if } x > 2 \end{cases}$.

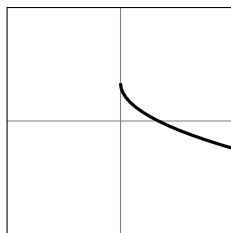


19. Match the functions with the graph:

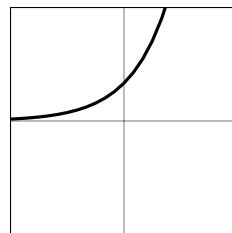
(a) e^x (III) (b) \sqrt{x} (IV) (c) $1 - \sqrt{x}$ (II) (d) e^{-x} (I)



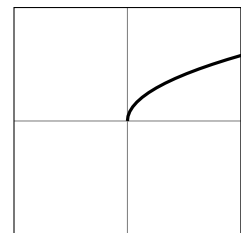
(I)



(II)



(III)



(IV)