Algebra Review

Name: Sols

1. If $4^{x+1} = 16$, then $x =$

(A) 1 (B) 3 (C) 5 (D) 7

$4^{x+1} = 4^2$

$x+1 = 2$

$x = 1$

2. If $f(x) = 2x + 1$, then the inverse function $f^{-1}(x) =$

(A) $2x - 1$ (B) $\frac{x}{2} - 1$ (C) $\frac{x-1}{2}$ (D) $2(x-1)$

$y = 2x+1 \rightarrow x = 2y+1 \rightarrow x-1 = 2y \rightarrow \frac{x-1}{2} = y = f^{-1}(x)$

3. What are all values of x for which $|x + 3| = x + 3$?

(A) All real numbers (B) All $x \geq -3$

(C) All $x \geq 0$ (D) All $x \geq 3$

$|x+3| = x+3$ when $x+3 \geq 0$

$x \geq -3$

4. If $f(x) = 3x - 1$ then $f(f(2)) =$

(A) 5 (B) 14 (C) 25 (D) $(3x-1)^2$

$f(2) = 3(2)-1 = 5$, $f(f(2)) = f(5) = 3(5)-1 = 14$

5. $\frac{x^2 + 5x + 6}{x + 1}$ is not defined for $x =$

(A) -3 (B) -2 (C) -1 (D) 1

undefined when $x+1 = 0$

$x = -1$

6. If $3^6 \times 3^x = 1$, then x equals

(A) 6 (B) $\frac{1}{6}$ (C) $-\frac{1}{6}$ (D) -6

$3^6 \cdot 3^x = 3^{6+x}$

$6+x = 0 \rightarrow x = -6$

Challenge

7. You are asked to write a quadratic equation where the sum of the roots is -3, and the product of the roots is -9. Which equation meets these requirements?

(A) $x^2 + 3x + 7 = 0$ (B) $2x^2 + 6x - 18 = 0$

(C) $x^2 - 12x + 27 = 0$ (D) $(x+3)(x+9) = 0$

$2(x^2+3x-9) = 0$

$(x-9)(x-3) = 0$

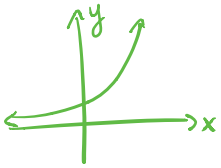
$x = 9, 3$ X

$x = -3, -9$ X

8. If $f(x) = \frac{x}{2}$, then $f(x+3) =$ $\frac{x+3}{2}$

(A) $\frac{x+3}{2}$ (B) $\frac{x}{2}+3$ (C) $x+\frac{3}{2}$ (D) $x+6$

9. If $y = 5^x$, which of the following indicates all possible values of y?



(A) All real numbers (B) All $y \geq 0$

(C) All $y > 0$ (D) All $y \geq 5$

10. If a and b are positive, $\log\left(\frac{a^2 b}{3}\right) =$ $\log(a^2)+\log(b)-\log(3) = 2\log a+\log b-\log 3$

(A) $2\log a + 2\log b - \log 3$ (B) $2\log a + \log b - \log 3$

(C) $2\log ab - 3$ (D) $\log 2 + \log a + \log b - \log 3$

11. What is the domain of $f(x) = \sqrt{3-x}$? $3-x \geq 0$ $3 \geq x$ or $x \leq 3$

(A) $x \leq 3$ (B) $x < 3$ (C) $x > -3$ (D) $x \geq -3$

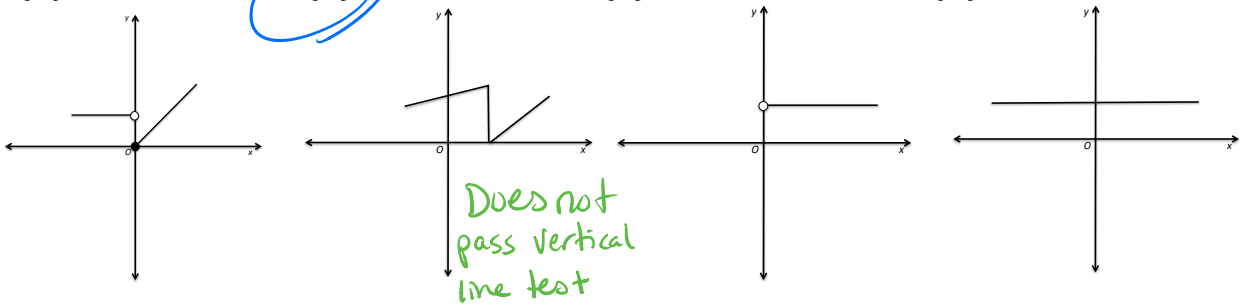
12. The graph of $y = -\frac{1}{4^x}$ is the same as the graph of which of the following?

(A) $y = \left(-\frac{1}{4}\right)^x$ (B) $y = -(4^{-x})$ $-\frac{1}{4^x} = -(4^{-x})$

(C) $y = -(4^x)$ (D) $y = 4^{-x}$

13. Which of the following is NOT the graph of a function $y = f(x)$?

(A) (B) (C) (D)



14. What is the solution set for the equation $|2x - 3| = 6$?

(A) { } (B) {4.5} (C) {4.5, -1.5} (D) {-4.5, -1.5}

$2x-3=6$ $\quad$ $2x-3=-6$
$2x=9$ $\quad$ $2x=-3$
$x=4.5$ $\quad$ $x=-3/2$
$=-1.5$

15. What is one solution for the accompanying system of equations?

$y = x^2 - 9, \quad y = x + 3$

(A) (3, 0) (B) (4, 7) (C) (0, -3) (D) (7, 4)

$x^2-9=x+3$
$x^2-x-12=0$
$(x-4)(x+3)=0$
$x=4,-3$
$y=4^2-9=7$

16. The expression $\left(\sqrt[3]{a^4}\right)\left(a^{-\frac{1}{2}}\right)$ when simplified, is equivalent to

(A) $\sqrt[3]{a^{-2}}$ (B) $\sqrt[4]{a^3}$ (C) $\sqrt[5]{a^{-4}}$ (D) $\sqrt[6]{a^5}$

$(a^{4/3})(a^{-1/2}) = a^{\frac{4}{3}-\frac{1}{2}} = a^{5/6} = \sqrt[6]{a^5}$

17. Which interval represents the range (y-values) of the function $y = 2^x - 1$?

(A) $(1, \infty)$ (B) $(-1, \infty)$ (C) $[1, \infty)$ (D) $[-1, \infty)$

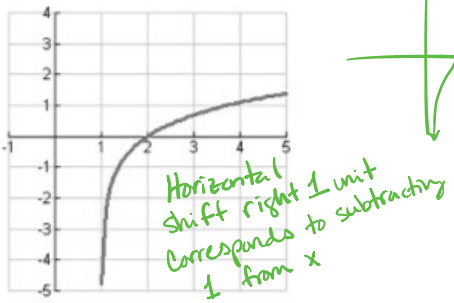
vertical shift down 1 unit

18. The fraction $\dfrac{\frac{x}{y} + x}{\frac{1}{y} + 1}$ is equal to

$\dfrac{\frac{x}{y}+x}{\frac{1}{y}+1} \cdot \dfrac{y}{y} = \dfrac{x+xy}{1+y} = \dfrac{x(1+y)}{1+y} = x$

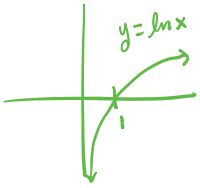
(A) $\dfrac{2xy}{1+y}$ (B) $\dfrac{x^2y}{1+y}$ (C) x (D) $2x$

19. The graph corresponds to which function?



(A) $-(e^{2+x})$ (B) $\ln(x+1)$

(C) $\ln(x-1)$ (D) $\dfrac{-2}{e^x}$



Horizontal shift right 1 unit corresponds to subtracting 1 from x

20. What is the solution set of the equation $|x^2 - 2x| = 3x - 6$?

(A) $\{2, \pm 3\}$ (B) {2} (C) $\{\pm 3\}$ (D) {2,3}

$x^2-2x=3x-6$ $\quad$ $x^2-2x=-3x+6$
$x(x-2)=3(x-2)$ $\quad$ $x(x-2)=-3(x-2)$
when $x=3$ and $x=2$ $\quad$ when $x=2$ and $x\neq 3$

Check: $|4-4| = 3(2)-6$ ✓
$|9-6| = 9-6$ ✓
$|9+6| = -9-6$ ✗

21. Given $f(x) = 2x^2 - 2x + 1$, find $f(x+3)$.

$2(x+3)^2 - 2(x+3) + 1$
$2(x^2+6x+9) - 2x - 6 + 1$
$2x^2 + 12x + 18 - 2x - 5$
$2x^2 + 10x + 13$

(A) $2x^2 + 10x + 13$ (B) $2x^2 + 10x + 25$
(C) $2x^2 + 14x + 13$ (D) $2x^2 + 14x + 25$

22. Find the domain of the function $f(x) = \frac{x+2}{\sqrt{x-3}}$

$x - 3 > 0$
$x > 3$

(A) $(-\infty, \infty)$ (B) $(3, \infty)$
(C) $[3, \infty)$ (D) All values less than 3, except -2.

23. Simplify the expression $\frac{6x^2+3x}{3x}$.

$\frac{3x(2x+1)}{3x} = 2x+1$

(A) $6x^2$ (B) $2x$ (C) $2x + 1$ (D) Not Given

24. Determine the slope of a line that contains the point (12,-3) and (12,5).

$\frac{5 - -3}{12 - 12} = \frac{8}{0}$ Undefined!

(A) 0 (B) -8 (C) 8 (D) Undefined

25. Find the difference $\frac{6}{8x} - \frac{x}{6}, x \neq 0$

$\frac{6}{2 \cdot 4x} - \frac{x}{2 \cdot 3} = \frac{6}{2 \cdot 4x} \cdot \frac{3}{3} - \frac{x}{2 \cdot 3} \cdot \frac{4x}{4x} = \frac{18 - 4x^2}{24x} = \frac{9 - 2x^2}{12x}$

(A) $\frac{6-x}{8x-6}$ (B) $\frac{1}{8}$ (C) $\frac{-2x^2+9}{12x}$ (D) $\frac{6-x}{48x}$

26. Simplify the expression $\frac{9x^2y^3}{12xy^4}$

$\frac{3 \cdot 3x^2y^3}{3 \cdot 4xy^4} = \frac{3x}{4y}$

(A) $\frac{3}{4}xy$ (B) $3xy^3\left(\frac{3x}{4y}\right)$ (C) $\frac{3x}{4y}$ (D) Not Given

27. Add the fractions $\frac{3}{x-y} + \frac{3}{x+y}$.

$\frac{3(x+y) + 3(x-y)}{(x-y)(x+y)} = \frac{3x + 3y + 3x - 3y}{x^2 - y^2} = \frac{6x}{x^2 - y^2}$

(A) $\frac{6}{x+y^2}$ (B) $\frac{6x+6y}{x^2-y^2}$
(C) $\frac{12}{x-y}$ (D) $\frac{6x}{x^2-y^2}$

28. Find the linear equation containing the points (5,2) and (-1,1).

(A) $y = \frac{1}{5}x + 1$ (B) $y = 6x + 7$

(C) $y = \frac{1}{6}x + \frac{7}{6}$ (D) Not Given

$m = \frac{2-1}{5-(-1)} = \frac{1}{6}$

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

$y - 1 = \frac{1}{6}x + \frac{1}{6}$

$y = \frac{1}{6}x + \frac{7}{6}$

29. Determine the point at which the lines $x + 2y = 9$ & $-2x - 3y = -3$ intersect.

(A) (-3,3) (B) (-21,15) (C) (3,4) (D) No Solution

$2(x + 2y = 9)$

$-2x - 3y = -3$

$2x + 4y = 18$

$+ \quad -2x - 3y = -3$

$y = 15$

$x = -2(15) + 9 = -21$

30. Simplify the fraction $\left(\frac{8x^3}{27y^6}\right)^{-\frac{1}{3}}$

$= \left(\frac{27y^6}{8x^3}\right)^{\frac{1}{3}} = \frac{27^{1/3}y^2}{8^{1/3}x} = \frac{\sqrt[3]{27}y^2}{\sqrt[3]{8}x} = \frac{3y^2}{2x}$

(A) $-\frac{2x}{3y^2}$ (B) $\frac{8}{27}xy^2$ (C) $\frac{3y^2}{2x}$ (D) Not Given

31. Given the function $f(x) = \begin{cases} 6x - 1, & if \ x \le -1 \\ 3x + 1, & if \ x > -1 \end{cases}$, find $f\left(-\frac{1}{3}\right)$

$-\frac{1}{3} > -1$

$f(-1/3) = 3(-1/3) + 1$

$= 0$

(A) 2 (B) 0 (C) -3 (D) -1

32. Find the $x-$ intercepts of the graph of the function $f(x) = x^2 - 3x + 1$

$0 = x^2 - 3x + 1$

$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(1)}}{2}$

$= \frac{3 \pm \sqrt{9-4}}{2}$

$= \frac{3 \pm \sqrt{5}}{2}$

(A) {0, 2} (B) {1, 0} (C) {-1, -2} (D) Not Given

33. Find and simplify $f(x+h) - f(x)$, where $f(x) = 2x^2 - 5$

(A) $2h^2 - 5$ (B) $2h^2 + 4xh + 4x^2 - 10$

(C) $2h^2 - 10$ (D) $2h^2 + 4xh$

$2(x+h)^2 - 5 - (2x^2 - 5)$

$= 2(x^2 + 2xh + h^2) - 5 - 2x^2 + 5$

$= 2x^2 + 4xh + 2h^2 - 2x^2 = 4xh + 2h^2$

34. State the domain of the function $f(x) = \sqrt{3x+2}$

(A) $x \le -\frac{2}{3}$ (B) $x < -\frac{2}{3}$

(C) $x \ge -\frac{2}{3}$ (D) $x > -\frac{2}{3}$

$3x + 2 \ge 0$

$3x \ge -2$

$x \ge -2/3$

35. Solve the exponential equation $5^{-n} = 125^{3n+5}$

$5^{-n} = (5^3)^{3n+5}$

$5^{-n} = 5^{3(3n+5)}$

$-n = 9n+15$

$-15 = 10n$

$n = -1.5$

(A) $n = -\frac{3}{2}$ (B) $n = -\frac{5}{4}$

(C) $n = -\frac{1}{2}$ (D) Not Given

36. Simplify the expression $2\log(x) + \log(y)$

$2\log(x) + \log(y)$

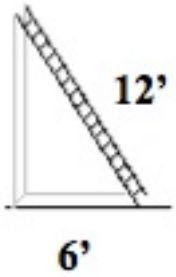
$= \log(x^2) + \log(y)$

$= \log(x^2 y)$

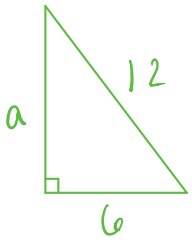
(A) $\log 2(x + y)$ (B) $\log(x^2 y)$

(C) $\log\left(\frac{x^2}{y}\right)$ (D) $\log(xy)^2$

37. A 12ft-long ladder is leaning against the side of a building. The base of the ladder is 6ft from the base of the building. Approximately how far up the side of the building does the ladder reach?



(A) 13.4 feet (B) 10.4 feet (C) 8 feet (D) Not enough information.



$a^2 + 6^2 = 12^2$

$a^2 + 36 = 144$

$a^2 = 108$

$a = \sqrt{108} \approx 10.4$ ft