

PSU Math Relays 2018
Algebraic Equations and Inequalities

MULTIPLE CHOICE. There are 30 algebraic equations or inequalities to solve. Select the letter of the most appropriate answer and **SHADE** in the corresponding region of the answer sheet. No credit is given for any marks on the answer sheet except the complete shading of the correct choice. Only the answer sheet will be graded. Calculators are **NOT ALLOWED**.

Solve the equation.

1) $(-5x + 5) + 1 = -4(x + 7)$

A) $\{-34\}$

B) $\{1\}$

C) $\{-32\}$

D) $\{34\}$

2) $0.40(30) + 0.70x = 0.60(30 + x)$

A) $\{50\}$

B) $\{30\}$

C) $\{60\}$

D) $\{70\}$

3) $\frac{2x}{5} = \frac{x}{3} + 3$

A) $\{45\}$

B) $\{-90\}$

C) $\{-45\}$

D) $\{90\}$

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

A) $\left\{\frac{1}{21}\right\}$

B) 0

C) $\{21\}$

D) $\left\{-\frac{7}{2}\right\}$

5) $\frac{3}{x-1} + 1 = \frac{7}{x-1}$

A) $x \neq -1; \{11\}$

B) $x \neq -1; \{5\}$

C) $x \neq 1; \{5\}$

D) $x \neq 1; \emptyset$

6) $\frac{x+8}{6} = \frac{3}{2} - \frac{x-1}{3}$

A) $\{1\}$

B) $\{27\}$

C) $\{10\}$

D) $\{0\}$

7) $\frac{5}{x+1} + \frac{2}{x-1} = \frac{4}{(x+1)(x-1)}$

A) No restrictions; $\{1\}$

C) $x \neq -1, 1; \emptyset$

B) $x \neq -1; \{1\}$

D) $x \neq -1, 1; \{2\}$

8) $\frac{8}{y+4} - \frac{6}{y-4} = \frac{6}{y^2-16}$

A) $\{\sqrt{58}\}$

B) $\{62\}$

C) $\{-31\}$

D) $\{31\}$

9) $25x^2 + 30x + 8 = 0$

A) $\left\{-\frac{2}{25}, -\frac{1}{2}\right\}$

B) $\left\{\frac{2}{5}, -\frac{4}{5}\right\}$

C) $\left\{-\frac{2}{5}, -\frac{4}{5}\right\}$

D) $\left\{\frac{2}{5}, \frac{4}{5}\right\}$

10) $-6x - 2 = (3x + 1)^2$

A) $\emptyset$

B) $\left\{\frac{1}{3}, 1\right\}$

C) $\left\{-1, -\frac{1}{3}\right\}$

D) $\left\{-\frac{1}{3}\right\}$

11) $x^3 - 8x^2 + 14x - 4 = 0$

A) $\{2, 6 + \sqrt{4}, 6 - \sqrt{4}\}$

C) $\{1, -1, 4\}$

B) $\{-2, 6 + \sqrt{7}, 6 - \sqrt{7}\}$

D) $\{2, 3 + \sqrt{7}, 3 - \sqrt{7}\}$

12) $(4x + 3)^2 = 7$

A) $\left\{\frac{3 - \sqrt{7}}{4}, \frac{3 + \sqrt{7}}{4}\right\}$

C) $\left\{\frac{\sqrt{7} - 3}{4}, \frac{\sqrt{7} + 3}{4}\right\}$

B) $\left\{\frac{-3 - \sqrt{7}}{4}, \frac{-3 + \sqrt{7}}{4}\right\}$

D) $\left\{-\frac{5}{2}, 1\right\}$

13) $(x - 7)^2 = -6$

A) $\{7 \pm \sqrt{6}\}$

B) $\{7 \pm i\sqrt{6}\}$

C) $\{-7 \pm 6i\}$

D) $\{1, 13\}$

14) $\sqrt{30x + 15} = x + 8$

A) $\{-6\}$

B) $\{7\}$

C) $\{-7\}$

D) $\{8\}$

15) $x - \sqrt{3x - 2} = 4$

A) $\{1, 2\}$

B) $\{2, 9\}$

C) $\{9\}$

D) $\{-1\}$

Solve the logarithmic equation. Be sure to reject any value that is not in the domain of the original logarithmic expressions. Give the exact answer.

16) $\log 4x = \log 5 + \log (x - 1)$

A) $\{-5\}$

B) $\left\{-\frac{5}{9}\right\}$

C) $\{5\}$

D) $\left\{\frac{4}{3}\right\}$

17) $\log (2 + x) - \log (x - 2) = \log 3$

A) $\emptyset$

B) $\{-4\}$

C) $\{4\}$

D) $\left\{\frac{3}{2}\right\}$

Solve the exponential equation. Express the solution set in terms of natural logarithms.

18) $e^{x+6} = 3$

A) $\{\ln 3 - 6\}$

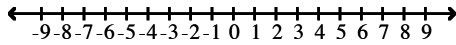
B) $\{e^{18}\}$

C) $\{\ln 9\}$

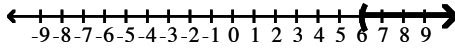
D) $\{e^3 + 6\}$

Solve the linear inequality. Other than $\emptyset$, use interval notation to express the solution set and graph the solution set on a number line.

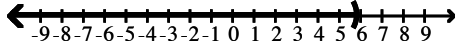
19) $4x + 3 < 27$



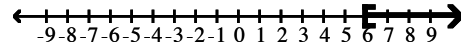
A) $(6, \infty)$



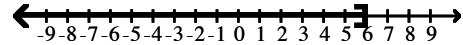
C) $(-\infty, 6)$



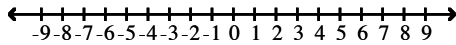
B) $[6, \infty)$



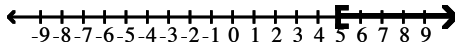
D) $(-\infty, 6]$



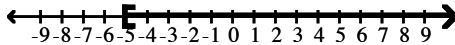
20) $-7x \geq 35$



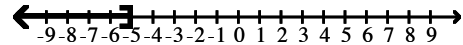
A) $[5, \infty)$



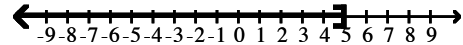
C) $[-5, \infty)$



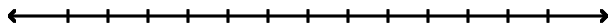
B) $(-\infty, -5]$



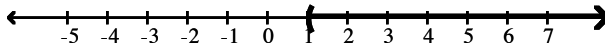
D) $(-\infty, 5]$



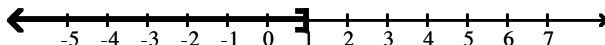
21) $5x - 3 > 4x - 2$



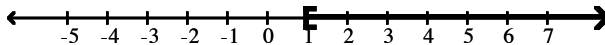
A) $(1, \infty)$



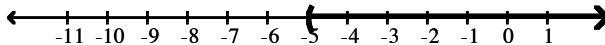
B) $(-\infty, 1]$



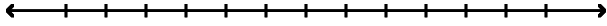
C) $[1, \infty)$



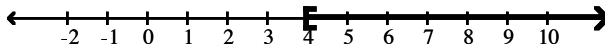
D) $(-5, \infty)$



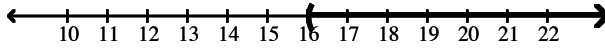
22) $18x + 18 > 3(5x + 10)$



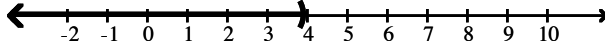
A) $[4, \infty)$



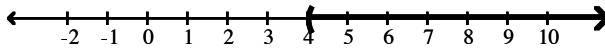
B) $(16, \infty)$



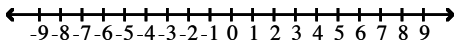
C) $(-\infty, 4)$



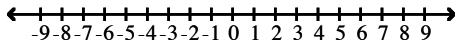
D) $(4, \infty)$



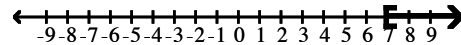
23) $8(x+3) \geq 7(x-2) + x$



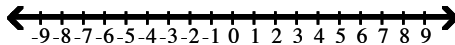
A) $\emptyset$



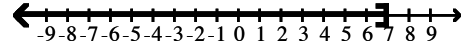
B) $[7, \infty)$



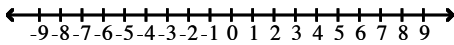
C) $(-\infty, \infty)$



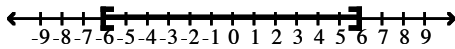
D) $(-\infty, 7]$



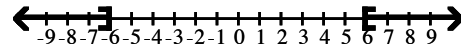
24) $|x| > 6$



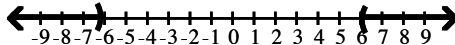
A) $[-6, 6]$



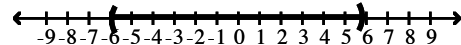
B) $(-\infty, -6] \cup [6, \infty)$



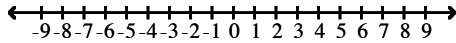
C) $(-\infty, -6) \cup (6, \infty)$



D) $(-6, 6)$

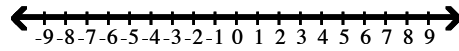
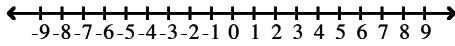


25) $-3x \leq -3(x - 4)$



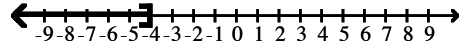
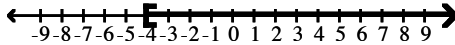
A) $\emptyset$

B) $(-\infty, \infty)$

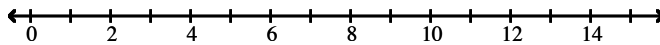


C) $[-4, \infty)$

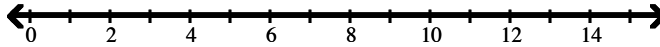
D) $(-\infty, -4]$



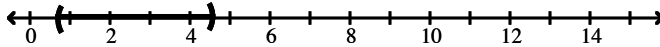
26) $|3x - 8| - 3 > -9$



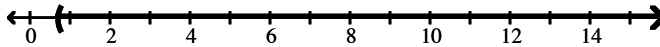
A) $(-\infty, \infty)$



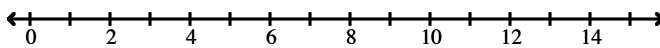
B) $\left(\frac{2}{3}, \frac{14}{3}\right)$



C) $\left[\frac{2}{3}, \infty\right)$



D) $\emptyset$



Solve the system of equations.

27)

$$-4x - 2y = 22$$

$$x = 5y$$

A) $\{(-4, -1)\}$

B) $\{(-5, -1)\}$

C) $\{(-1, -5)\}$

D) $\{(-5, 1)\}$

28) $x - y + 4z = 3$

$$4x + z = 2$$

$$x + 4y + z = 22$$

A) $\{(2, 5, 0)\}$

B) $\{(0, 5, 2)\}$

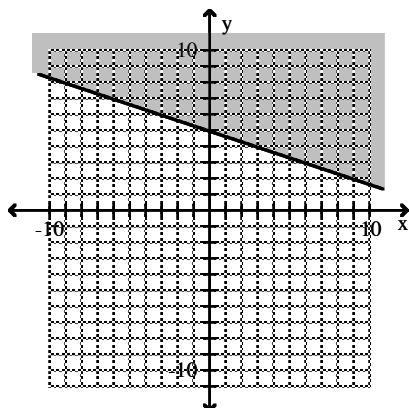
C) $\{(5, 0, 2)\}$

D) $\{(2, 0, 5)\}$

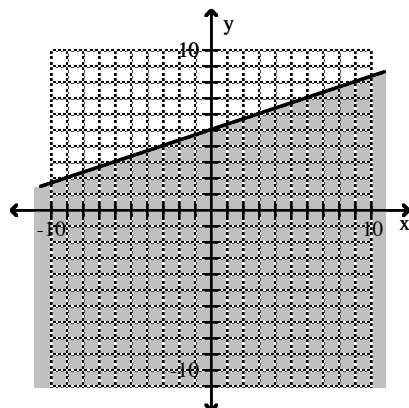
Graph the inequality.

29) $3x + y \leq 5$

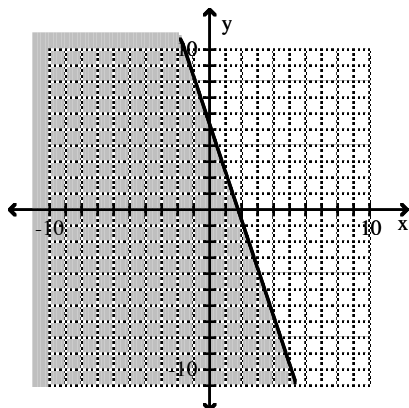
A)



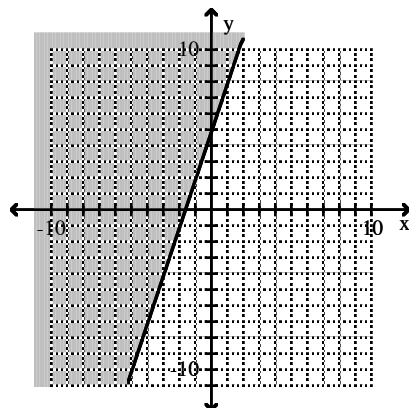
B)



C)



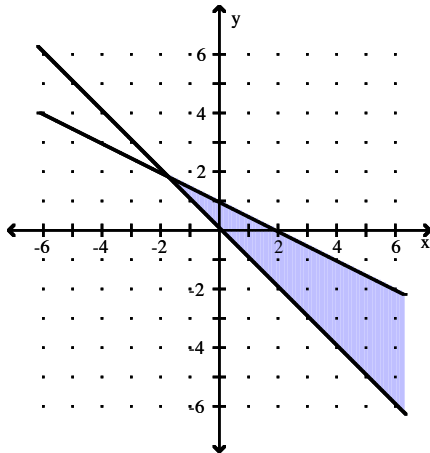
D)



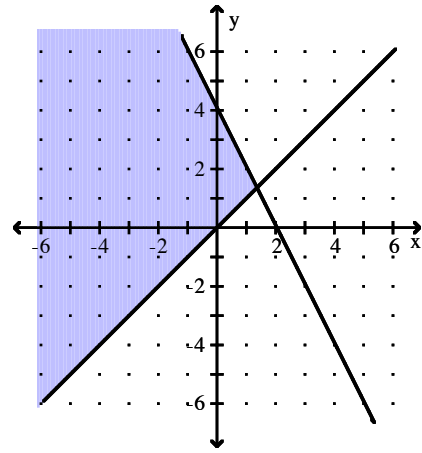
Graph the solution set of the system of inequalities or indicate that the system has no solution.

$$\begin{aligned} 30) \quad & x + 2y \geq 2 \\ & x - y \leq 0 \end{aligned}$$

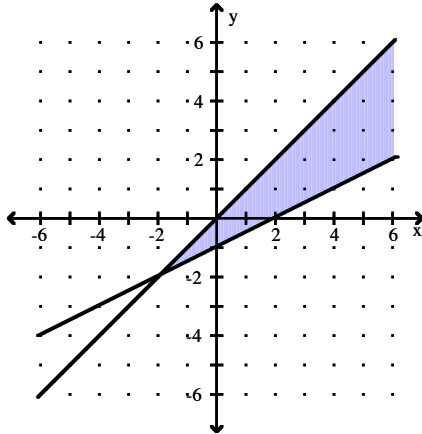
A)



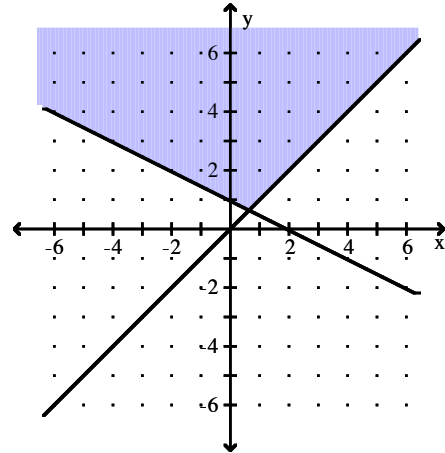
B)



C)



D)



Answer Key

Testname: ALG. EQUATIONS & INEQUALITIES.2018

- 1) D
- 2) C
- 3) A
- 4) C
- 5) C
- 6) A
- 7) C
- 8) D
- 9) C
- 10) C
- 11) D
- 12) B
- 13) B
- 14) B
- 15) C
- 16) C
- 17) C
- 18) A
- 19) C
- 20) B
- 21) A
- 22) D
- 23) C
- 24) C
- 25) B
- 26) A
- 27) B
- 28) B
- 29) C
- 30) D