1. Which expression is equivalent to $\frac{2x+6}{x^2+2x-24} \cdot \frac{x^2+2x-24}{x^2-7x+12}$?

A $\frac{2}{x-4}$

B $\frac{2(x+3)}{x-3}$

C $\frac{2(x+3)}{(x-4)(x-3)}$

D $\frac{2(x+3)}{(x+4)(x-3)}$

2. Which expression is equivalent to $\frac{x+3}{6x-3} \div \frac{x^2+2x-3}{2x-1}$?

A $3(x-1)$

B $\frac{x-1}{3}$

C $\frac{3}{x-1}$

D $\frac{1}{3(x-1)}$

3. Multiply: $\sqrt[3]{12x^2} \cdot \sqrt[3]{126x^2}$

A $6x(\sqrt[3]{7x})$

B $6x(\sqrt[3]{21x})$

C $6x^2(\sqrt[3]{42})$

D $6x^2(\sqrt[3]{63})$

4. Which polynomial function has as zeros 3 and $4+i$?

A $f(x) = x^3 - 11x^2 + 41x - 51$

B $f(x) = x^3 - 5x^2 - 7x + 51$

C $f(x) = x^3 + 5x^2 - 7x - 51$

D $f(x) = x^3 + 11x^2 + 41x + 51$

5. If $h(x) = 2x$ and $g(x) = 3x^2 + 1$, what is $h(g(x))$?

A $6x^2 + 1$

B $6x^2 + 2$

C $12x^2 + 1$

D $12x^2 + 2$

22. Let x and y be real numbers. If $(x + yi) - (2 - 3i) = -6 + 4i$, what are the values of x and y?

A $x = 8, y = 7$

B $x = 8, y = 1$

C $x = -4, y = 7$

D $x = -4, y = 1$

$x - 2 = -6$
$x = -4$
$yi - -3i = 4i$
$yi = 1i$
$y = 1$

23. If $f(x) = 2x + 1$ and $g(x) = x^3$, what is $f(g(3))$?

A 343

B 189

C 55

D 34

$g(3) = 3^3 = 27$
$f(27) = 2(27) + 1$
$= 55$

24. In which direction does the graph of $y = (x + 2)^{\frac{1}{2}} + c$ shift as c decreases?

A right

B left

C up

D down

c moves graph along y axis
↑ or ↓
If c ↓ so does the graph

25. What is the value of z in the solution of this system?

$x + y - z = -5$
$2x + z + 1 = -2y$
$x - y = 3z + 3$

make sure all variables line up!

A -7

B -1

C 3

D 5

$x + y - z = -5$
$2x + 2y + z = -1$
$x - y - 3z = 3$

put into matrix (3x4)
3 rows, 4 columns

$$\begin{bmatrix} 1 & 1 & -1 & -5 \\ 2 & 2 & 1 & -1 \\ 1 & -1 & -3 & 3 \end{bmatrix}$$

calculate rref

$$\begin{bmatrix} 1 & 0 & 0 & 5 \\ 0 & 1 & 0 & -7 \\ 0 & 0 & 1 & 3 \end{bmatrix}$$

$x = 5$
$y = -7$
$z = 3$

26. What is the domain of $f(x) = -2x^3 + x^2 + 1$?

(A) the set of all real numbers

B $\{x|-3 < x < 2\}$

C $\{x|-2 < x < 3\}$

D the empty set

Graph it! Any values x can't be?

27. The population of a small town in North Carolina is 4,000, and it has a growth rate of 3% per year. Which expression can be used to calculate the town's population x years from now?

A $3(4{,}000)^x$

(B) $4{,}000(1.03)^x$

C $4{,}000x^{1.03}$

D $4{,}000x^3$

$y = ab^x$

a = start value

b = increase

x = # of years

28. The graph of $f(x) = x^2 + 3$ is translated to produce the graph of $g(x) = (x+2)^2 + 3$. In which direction was the graph of f translated?

A up

B down

(C) left

D right

Graph them both look at how it moved

29. Solve for x: $\frac{x-1}{x+5} = \frac{x}{2(x+5)}$

A -5

(B) 2

C -5 or 2

D 5 or -2

$\frac{x-1}{x+5} = \frac{x}{2x+10}$

$x(x+5) = (2x+10)(x-1)$

$x^2+5x = 2x^2-2x+10x-10$

$x^2+5x = 2x^2+8x-10$

$x^2+3x-10=0$

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

$x=2$ ✓ $x=-5$ ✗

-5 makes denominator $=0$.

31. Which graph represents the system of inequalities below?

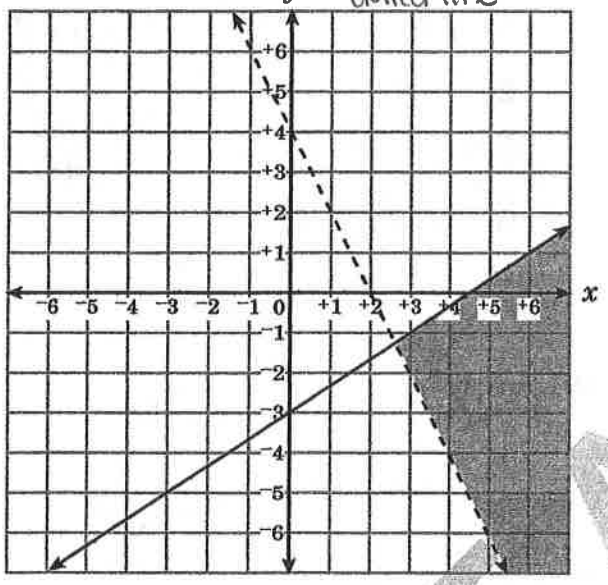
$2x - 3y \geq 9$
$4x + 2y < 8$

$-3y \geq -2x+9$
$y \leq 2/3x - 3$
↑ solid line

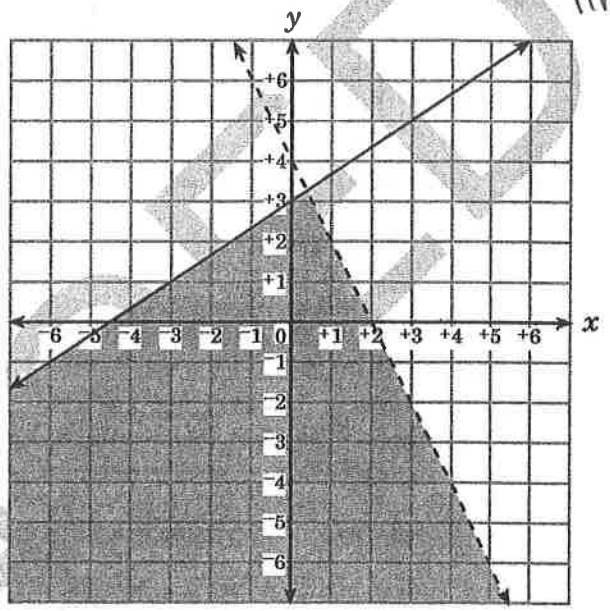
$2y < -4x+8$
$y < -2x+4$
↓ dotted line

both less
So Shade
below each line

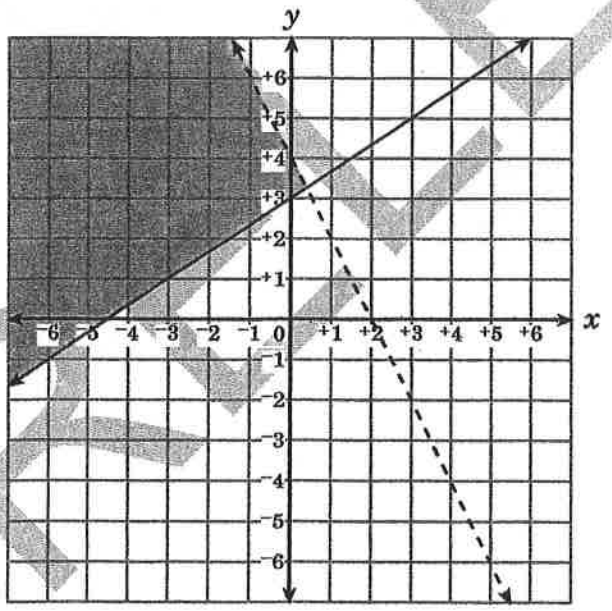
A



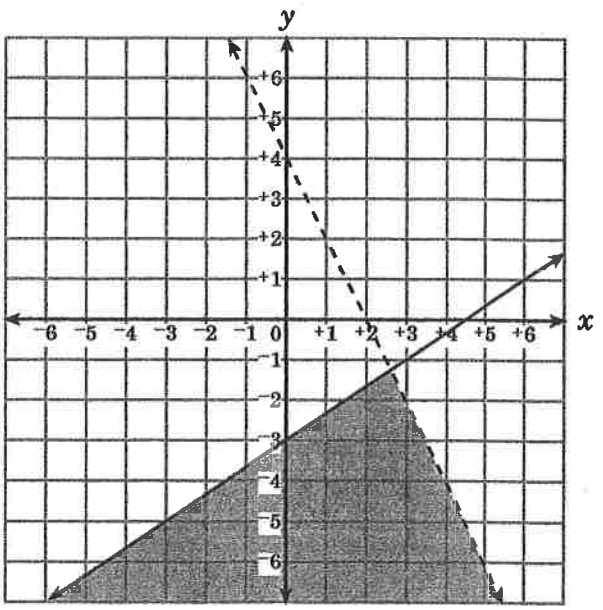
B



C



D



35. Simplify:

$\left(x^{\frac{3}{4}}\right)^3$ power to power - multiply exponents

A $x^{\frac{27}{64}}$

B $x^{\frac{9}{4}}$

C $x^{\frac{9}{12}}$

D $x^{\frac{15}{4}}$

36. The area of a rectangular window is $(4x^2 - 21x - 18)$. Both the length and the width are polynomials with integer coefficients. Which of the following could represent the length of the window?

A $4x + 6$

B $4x + 3$

C $x + 6$

D $x + 3$

$A = l \cdot w$

$A = 4x^2 - 21x - 18$

↑ factor

use rainbow method

$x^2 - 21x - 72$

$(x + \frac{3}{4})(x - \frac{24}{4})$

$(4x + 3)(x - 6)$

37. Which binomial is a factor of $\left(x^3 - x^2\right) + \left(3x - 3\right)$?

Factor by grouping or use synthetic division

A $x - 3$ $x^2(x-1) + 3(x-1)$

B $x + 1$ $(x^2+3)(x-1)$

C $x^2 - 1$ OR Graph - zero at 1

D $x^2 + 3$

1	1	−1	3	−3
	↓	1	0	3
	1	0	3	0

(x^2+3)

$(x-1)$

38. If 5 tractors can plow a field in 4 hours, how many hours will it take 3 tractors to plow the field?

A $6\frac{2}{3}$

B $6\frac{1}{2}$

C $5\frac{2}{3}$

D $5\frac{1}{2}$

$5 \times \frac{4}{3}$ inverse variation

39. Solve: $3x - 7\sqrt{x} + 2 = 0$

(A) $x = \frac{1}{9}, x = 4$

B $x = \frac{1}{3}, x = 4$

C $x = \frac{1}{9}, x = \frac{-1}{3}$

D $x = \frac{1}{3}, x = \frac{1}{9}$

plug in values to check

40. What is the ***approximate*** value of the greatest zero of $f(x) = x^3 - 6x^2 - x + 3$?

A -0.75

B 2.84

(C) 6.08

D 6.31

graph - find furthest x-intercept

41. What are the vertical asymptotes of the function $f(x) = \frac{4x^2 - 100}{2x^2 + x - 15}$?

A $x = -5, x = 5$

B $x = -5, x = 4, x = 5$

(C) $x = -3, x = \frac{5}{2}$

D $x = -3, x = \frac{5}{2}, x = \frac{20}{3}$

factor denominator

$2x^2 + x - 15$

$x^2 + x - 30$

$(x-5)(x+6)$

$(x-5/2)(x+3)$

$(2x-5)(x+3)$

$x = 5/2 \quad x = -3$

42. A poll shows that it is likely that, with a margin of error of ±2 percentage points, 78% of those randomly selected from a population would vote for a particular candidate. This situation can be described by the inequality $|x - 78| \leq 2$. Which graph shows the percentage of voters (according to the inequality) who favor the candidate?

A 

B 

C 

(D) 

$x - 78 \leq 2$ $\quad x - 78 \geq -2$

$x \leq 80$ $\quad x \geq 76$

$76 \leq x \leq 80$

43. Which equation represents the graph of $y = x^2$ translated 1 unit right and 2 units down?

A $y = -(x-1)^2 - 2$

(B) $y = (x-1)^2 - 2$

C $y = -(x+1)^2 + 2$

D $y = (x+1)^2 - 2$

$y = (x-h)^2 + k$

1 right

$y = (x-1)^2$

2 down

$y = (x-1)^2 - 2$

44. Which is the solution set of the equation $x + 2 = \frac{4}{x-2}$?

(A) $\{\pm 2\sqrt{2}\}$

B $\{2\sqrt{2}\}$

C $\left\{\frac{-1 \pm \sqrt{17}}{2}\right\}$

D $\left\{\frac{-1 + \sqrt{17}}{2}\right\}$

$(x+2)(x-2) = 4$

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

$x^2 - 8 = 0$

$x^2 = 8$

$x = \pm 2\sqrt{2}$

45. When interest is compounded n times a year, the accumulated amount (A) after t years is given by the formula

$$A = P\left(1 + \frac{r}{n}\right)^{nt}.$$

where P is the initial principal and r is the annual rate of interest. ***Approximately*** how long will it take \$2,000 to double at an annual interest rate of 5.25% compounded monthly?

$4000 = 2000\left(1 + \frac{.0525}{12}\right)^{12t}$

$2 = 1.004375^{12t}$

$\log 2 = 12t \log 1.004375$

$12t = \frac{\log 2}{\log 1.004375}$

$12t = 158.7799627$

$t = 13.23$

A 13.98 years

B 13.71 years

C 13.23 years

D 13.08 years

46. Alan has just started a job that pays a salary of \$21,500. At the end of each year of work, he will get a 5% salary increase. What will his salary be after getting his fifth increase?

$a_n = a_1 \cdot r^{n-1}$

$a_6 = 21{,}500 \cdot 1.05^{6-1}$

$a_6 = 27{,}440$

$a_1 = 21{,}500$

$a_6 = ?$

$n = 6$

$r = 1.05$

A \$22,631

B \$24,889

C \$26,133

D \$27,440

47. In the function $f(x) = a(x-4)^2$, where $a > 0$, what happens to the graph of f as the value of a increases?

Graph it to See changes!

A The graph narrows.

B The graph widens.

C The graph shifts up.

D The graph shifts right.

48. Which is the inverse of the function $f(x) = x - 9$?

$y = x - 9$

$x = y - 9$

$x + 9 = y$

$f^{-1}(x) = x + 9$

A $f^{-1}(x) = \frac{1}{x+9}$

B $f^{-1}(x) = x + 9$

C $f^{-1}(x) = 9 - x$

D $f^{-1}(x) = \frac{1}{x-9}$