

Math Placement Exam

Topics that May Appear on the RIT Math Placement Exam

I. Algebra

Students should be able to

- Manipulate exponents
- Simplify algebraic expressions
- Perform operations with polynomials, including division with remainders
- Factor polynomials
- Complete the square
- Use Quadratic Formula
- Solve systems of equations
- Solve equations and inequalities
- Solve equations with rational expressions
- Construct algebraic expressions that represent quantities (word problems)

II. Functions

Students should be familiar with

- Domain and range
- Function notation and evaluation
- Function types, including
- absolute value
- polynomial
- rational
- exponential
- logarithmic
- trigonometric
- Composition of functions
- Graphs of functions

III. Trigonometry

Students should be familiar with

- Pythagorean Theorem
- Radian measure
- Unit circle / reference angles
- Sine, cosine, tangent of any angle
- Law of Cosines and Law of Sines

IV. Geometry

Students should be familiar with

- Equations of lines and parabolas
- Similar triangles
- Areas of simple figures, such as triangles, rectangles, trapezoids, and circles
- Volumes of simple solids, such as a box, a cylinder, or sphere

Sample Test for Mathematics
Rochester Institute of Technology, Dubai

Student's Name:

Students' ID:

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the equation.

$$1) 1 - \frac{10}{7x} = \frac{8}{4}$$

A) $\left\{ \frac{40}{7} \right\}$

B) $\{10\}$

C) $\left\{ -\frac{10}{7} \right\}$

D) $\left\{ \frac{10}{7} \right\}$

1) _____

Match the equation of the parabola with the appropriate description.

$$2) y - 8 = 2(x + 7)^2$$

A) Vertex at (8, -7)

B) Vertex at (7, -8)

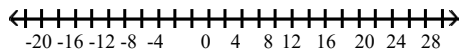
C) Vertex at (-7, 8)

D) Vertex at (-8, 7)

2) _____

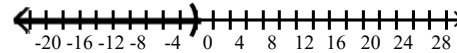
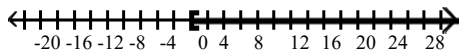
Solve and graph the inequality. Give answer in interval notation.

$$3) \frac{x-1}{12} \geq \frac{x-2}{18} + \frac{1}{36}$$



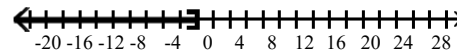
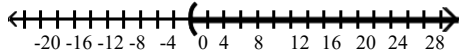
A) $[0, \infty)$

B) $(-\infty, 0)$



C) $(0, \infty)$

D) $(-\infty, 0]$



3) _____

We take $0 \leq t < \frac{\pi}{2}$ and $\sin t$ is given. Use the Pythagorean identity $\sin^2 t + \cos^2 t = 1$ to find $\cos t$.

$$4) \sin t = \frac{\sqrt{5}}{3}$$

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

B) $\frac{\sqrt{5}}{2}$

C) $\frac{2\sqrt{5}}{5}$

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

4) _____

Solve this equation.

$$5) \sqrt{p^2 - 5p + 36} = p + 1$$

A) $\left\{ \frac{-5}{2} \right\}$

B) $\{-5\}$

C) $\{5\}$

D) $\{6\}$

5) _____

Evaluate the composition of functions.

$$6) \text{ Let } f(x) = x^2 + 4 \text{ and } g(x) = 3x + 5. \text{ Find } (g \circ f)(6).$$

A) 115

B) 125

C) 45

D) 533

6) _____

Solve the problem.

7) $4(5 - 3x) = \frac{1}{256}$

7) _____

A) $\{8\}$

B) $\left\{\frac{1}{64}\right\}$

C) $\{-3\}$

D) $\{3\}$

Solve the given equation for x.

8) $\log_4 \sqrt[4]{3} = x$

8) _____

A) $\{\sqrt{3}\}$

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

C) $\{12\}$

D) $\{3\}$

Rewrite the given expression as a single logarithm. Assume that all variables are defined in such a way that variable expressions are positive and bases are positive numbers not equal to 1.

9) $(\log_x x - \log_x y) + 2 \log_x z$

9) _____

A) $\log_x \frac{z^2}{y}$

B) $\log_x \frac{z^2}{y}$

C) $\log_x \frac{2xz}{y}$

D) $\log_x \frac{x}{z^2 y}$

x

x y

x y

x
z²y

Use the LCD to clear fractions and solve the given equation.

10) $\frac{x}{7} = \frac{x}{3} + \frac{10}{7}$

10) _____

A) -15^2

B) 0

C) $-\frac{15}{2}$

D) $-\frac{10}{7}$

Solve for y, as appropriate.

11) $\ln(y - 9) - \ln 7 = x + \ln x$

11) _____

A) $7xe^x + 9$

B) $e^x + 7x + 9$

C) $(x + 7)e^x + 9$

D) $2x + 16$

Factor the polynomial completely, given that the binomial is a factor.

12) $x - 7, x^3 + 5x^2 - 48x - 252$

12) _____

A) $(x - 7)(x^2 - 12x + 36)$

B) $(x + 7)(x - 6)(x - 6)$

C) $(x - 7)(x^2 + 36)$

D) $(x - 7)(x + 6)(x + 6)$

Find all of the real and imaginary zeros for the polynomial function.

13) $f(x) = x^3 - 7x^2 + x - 7$

13) _____

A) 7, -i, i

B) -7, 7, i

C) -7, -i, i

D) -1, 1, 7

Use division to write the rational expression in the form quotient + remainder/divisor.

14) $\frac{x^2 + 10x + 19}{x + 7}$

14) _____

A) $x + 4$

B) $x + 3 - \frac{2}{x + 7}$

C) $x + 3 + \frac{2}{x + 7}$

D) $\frac{x + 3}{x + 7}$

Solve the problem.

15) The polynomial function $I(t) = -0.1t^2 + 1.4t$ represents the yearly income (or loss) from a real estate investment, where t is time in years. After what year does income begin to decline?

15) _____

A) 7

B) 9.33

C) 14

D) 6

Use ordinary division of polynomials to find the quotient and remainder when the first polynomial is divided by the second.

16) $x^4 + 5x^3 + 5x^2 + 5x + 4, x^2 + 1$

A) $x^2 - 5x + 4$

B) $x^2 - 5x + 4; 20x - 16$

16) _____

C) $x^2 + 5x + 4; 20x - 16$

D) $x^2 + 5x + 4$

Find all real solutions to the equation.

17) $(x - 1)^{-1/2} = \frac{1}{3}$

A) $\left\{\frac{1}{3}\right\}$

B) $\{10\}$

C) $\{8\}$

D) $\left\{\frac{8}{9}\right\}$

17) _____

Find all real and imaginary solutions to the equation.

18) $(2m + 1)^2 - 4(2m + 1) - 21 = 0$

A) $\{2, 3\}$

B) $\{-4\}$

C) $\{-7, 3\}$

D) $\{4, 3\}$

18) _____

Solve the absolute value equation.

19) $|x^2 + 3x - 20| = 20$

A) $\{-5, 8\}$

B) $\{-8, 5\}$

C) $\{-3, 0\}$

D) $\{-8, -3, 0, 5\}$

19) _____

Find the domain and range of the function.

20) $f(x) = -2 + \sqrt{x}$

A) D: $[0, \infty)$, R: $(-\infty, \infty)$

B) D: $(-\infty, \infty)$, R: $[-2, \infty)$

C) D: $[0, \infty)$, R: $[-2, \infty)$

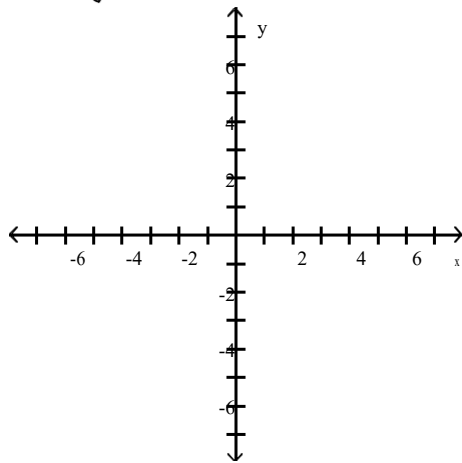
D) D: $(-\infty, 0]$, R: $(-\infty, -2]$

20) _____

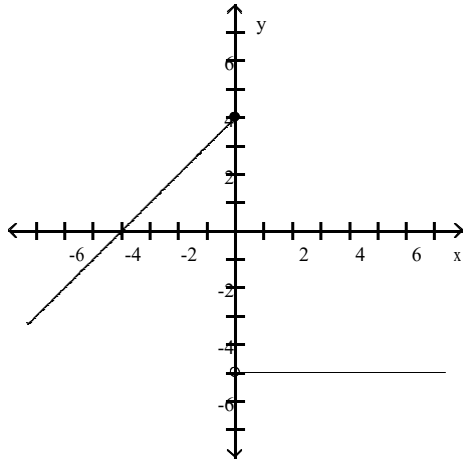
Graph the function.

21) $g(x) = \begin{cases} -5 & x \leq 0 \\ x + 4 & x > 0 \end{cases}$

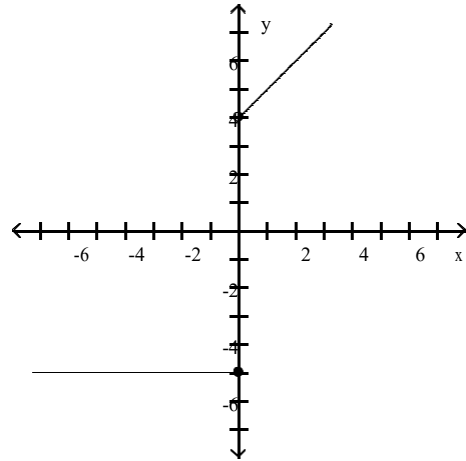
21) _____



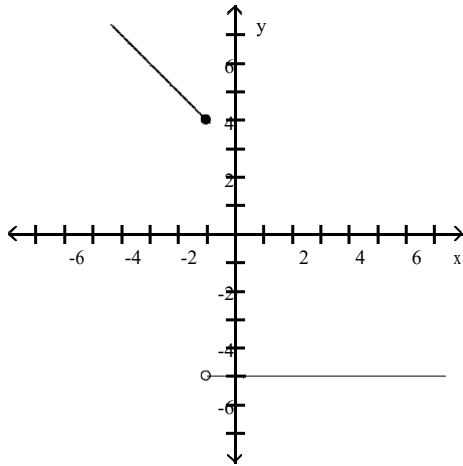
A)



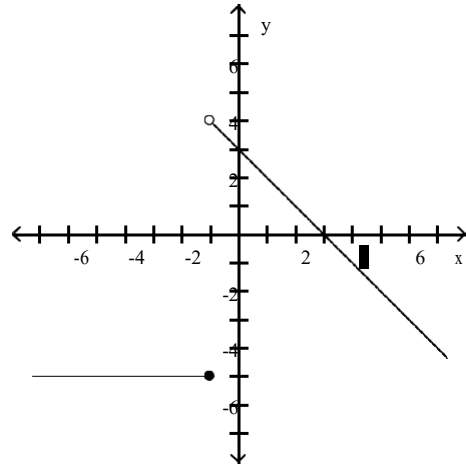
B)



C)



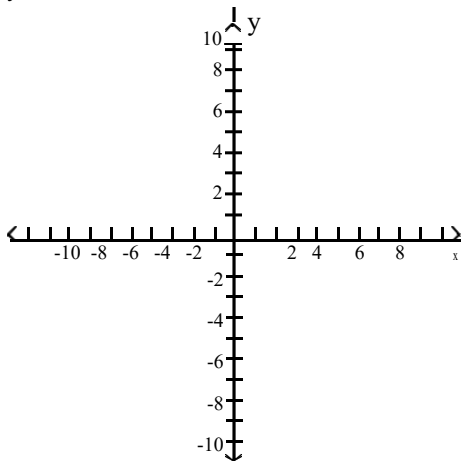
D)



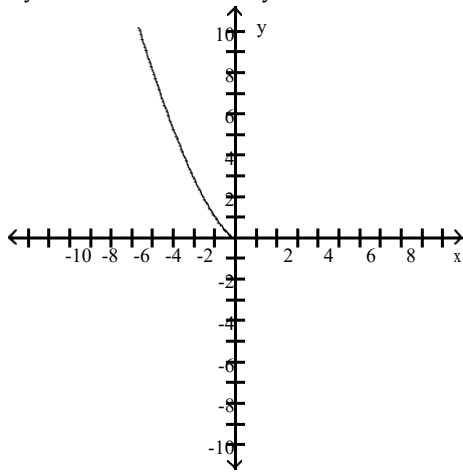
Graph the function. Determine the symmetry, if any, of the function.

22) $y = (-x)^{3/2}$

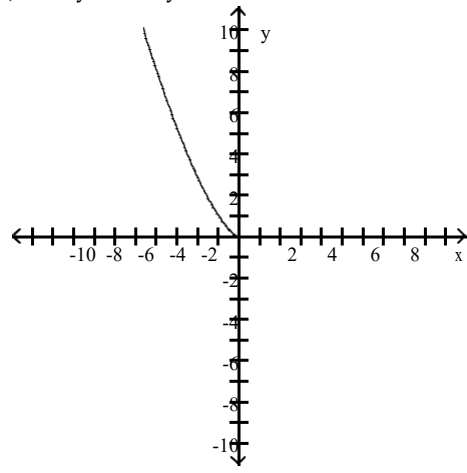
22) _____



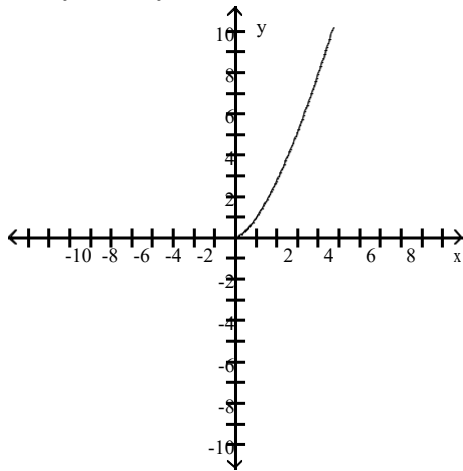
A) Symmetric about the y-axis



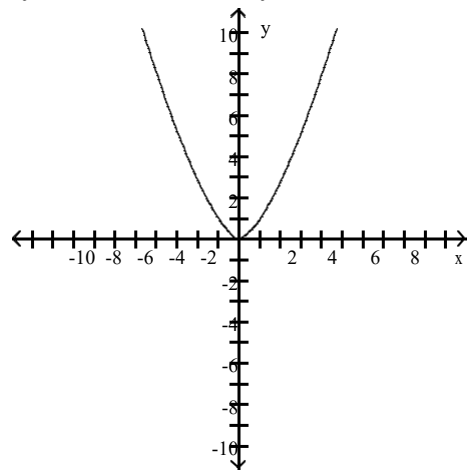
B) No symmetry



C) No symmetry



D) Symmetric about the y-axis

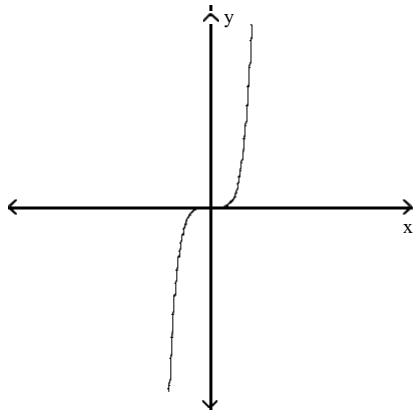


Match the equation with its graph.

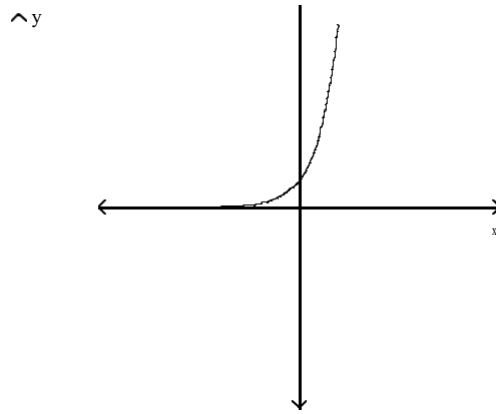
23) $y = 4^x$

23) _____

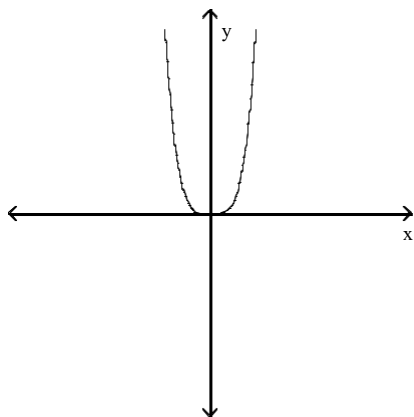
A)



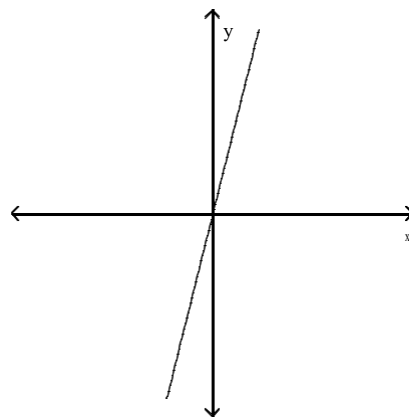
B)



C)



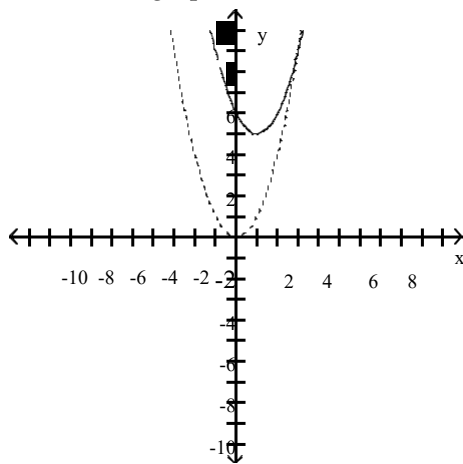
D)



Solve the problem.

24) The accompanying figure shows the graph of $y = x^2$ shifted to a new position. Write the equation for the new graph.

24) _____



A) $y = (x - 5)^2 - 1$

B) $y = (x - 1)^2 - 5$

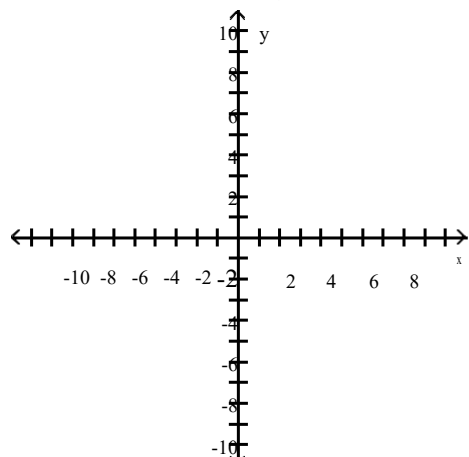
C) $y = (x + 1)^2 + 5$

D) $y = (x - 1)^2 + 5$

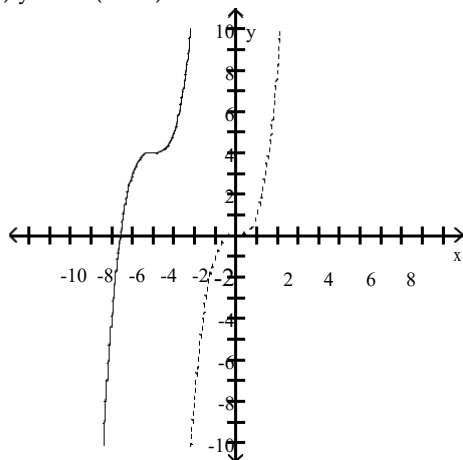
The problem tells how many units and in what direction the graph of the given equation is to be shifted. Give an equation for the shifted graph. Then sketch the original graph with a dashed line and the shifted graph with a solid line.

25) $y = x^3$

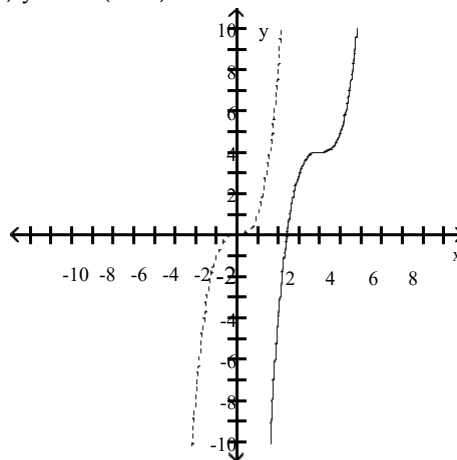
Down 4, left 4



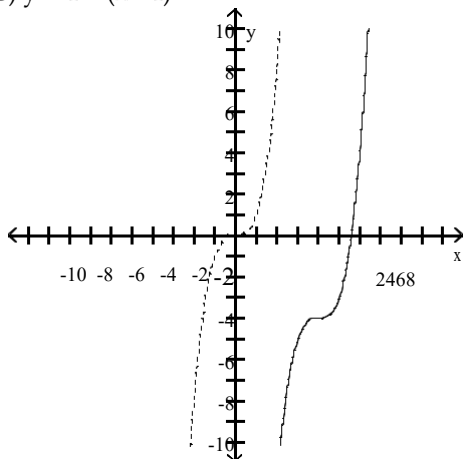
A) $y - 4 = (x + 4)^3$



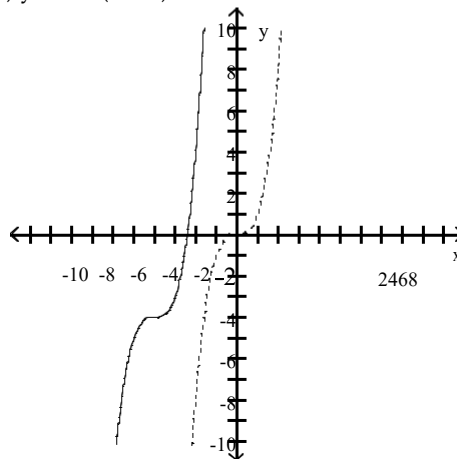
B) $y - 4 = (x - 4)^3$



C) $y + 4 = (x - 4)^3$



D) $y + 4 = (x + 4)^3$



Match the equation of the ellipse with the appropriate description.

26) $\frac{x^2}{25} = 1 - \frac{y^2}{49}$

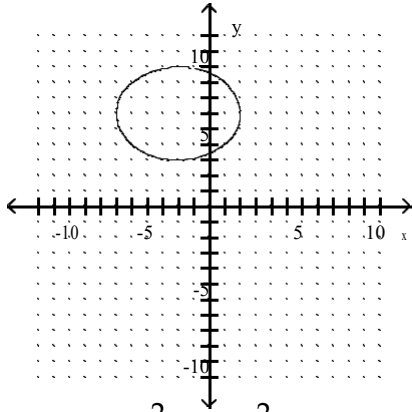
- A) x-intercepts ± 7 ; y-intercepts ± 5
- C) x-intercepts ± 5 ; y-intercepts ± 7

- B) x-intercepts ± 49 ; y-intercepts ± 25
- D) x-intercepts ± 25 ; y-intercepts ± 49

Choose the equation that matches the graph.

27)

27) _____



A) $\frac{(x+2)^2}{9} + \frac{(y-6)^2}{16} = 1$

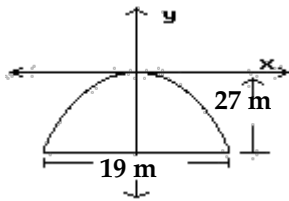
B) $\frac{(x+2)^2}{16} - \frac{(y-6)^2}{9} = 1$

C) $\frac{(x+2)^2}{16} + \frac{(y-6)^2}{9} = 1$

D) $\frac{(y-6)^2}{9} - \frac{(x+2)^2}{16} = 1$

Solve the problem.

28) A tunnel is in the shape of a parabola. The maximum height is 27 m and it is 19 m wide at the base. What is the vertical clearance 8 m from the edge of the tunnel? _____



A) 26.3 m

B) 26.2 m

C) 0.7 m

D) 0.8 m

Write an equation for the hyperbola.

29) vertices at (-5, 2) and (-1, 2), passing through the point (-6, 4)

29) _____

A) $\frac{(x+3)^2}{4} - \frac{(y-2)^2}{\frac{36}{5}} = 1$

B) $\frac{(x+3)^2}{4} - \frac{(y-2)^2}{\frac{16}{5}} = 1$

C) $\frac{(x+3)^2}{\frac{36}{5}} - \frac{(y-2)^2}{4} = 1$

D) $\frac{(x+3)^2}{\frac{16}{5}} - \frac{(y-2)^2}{4} = 1$

Factor by grouping.

30) $6x^4 - 10x^2y^5 + 9x^2y^5 - 15y^{10}$

30) _____

A) $(6x^2 + 3y^5)(x^2 - 5y^5)$

B) $(2x^2 + 3y^5)(3x^2 - 5y^5)$

C) $(2x^2 + 3y)(3x^2 - 5y^{10})$

D) $(2x^2 - 3y^5)(3x^2 + 5y^5)$

Answer Key

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