

T MATYC  
DEVELOPMENTAL MATHEMATICS TEST  
Spring 2004

1. What is the remainder when  $P(x) = -x^5 - 3x^4 - x^2 - x + 2$  is divided by  $Q(x) = x + 2$ ?  
A. -72                      B. -16                      C. 8                      D. 80
  
2. The weekly profit function of The Gidget Factory is given by  $f(x) = 3x^2 - 36x + 7$ , where  $x$  is the number of items sold. How many gidgets must be sold each week to achieve maximum profit?  
A. 3                      B. 6                      C. 9                      D. 12
  
3. Solve for  $x$ :  $\sqrt{x-5} + 3 = -2$   
A. no solution              B. 0                      C. 10                      D. 30
  
4. Find the  $x$ -intercept for the line that passes through the points  $(-1, 1)$  and  $(5, 4)$ .  
A. -3                      B.  $\frac{1}{2}$                       C. 2                      D. 13
  
5. Solve the following equation for  $x$ :  $R(x^2 + y) = 6$ .  
A.  $\frac{6\sqrt{R}}{R} - y$               B.  $\frac{\sqrt{6R - R^2y}}{R}$               C.  $\frac{6 - Ry}{R}$               D.  $\frac{\sqrt{6 - R}}{y}$
  
6. A boy on a bicycle climbs a slope at 50 meters per minute. He descends the same slope at 150 meters per minute. If the round trip takes 24 minutes, how long is the slope?  
A. 100 meters              B. 200 meters              C. 900 meters              D. 3600 meters
  
7. Find an equation of the perpendicular bisector of the line segment joining the points  $A(1, 4)$  and  $B(7, -2)$ .  
A.  $y = -x + 3$               B.  $y = -x + 5$               C.  $y = x - 3$               D.  $y = x - 8$

8. Find the x and y intercepts:  $y = 4 - |x|$ .

A. x intercept 4  
y intercept 4

B. x intercept  $\pm 4$   
y intercept 4

C. x intercept 0  
y intercept 4

D. x intercept 0  
y intercept  $\pm 4$

9. Fully simplify:  $\frac{x^{-2} - y^{-2}}{x^{-1} + y^{-1}}$ .

A.  $\frac{(x + y)^2}{xy}$

B.  $\frac{y - x}{xy}$

C.  $\frac{1 + xy}{xy}$

D.  $\frac{-y + x}{(xy)^2}$

10. Completely factor:  $3a^3b + 27ab^3$

A.  $30a^4b^4$

B.  $3ab(a^2 + 9b^2)$

C.  $3ab(a + 3b)(a - b)$

D.  $3ab(a + 3b)(a - 3ab + 9b^2)$

11. The maximum weight that a rectangular beam can support varies jointly as its width and the square of its height and inversely as its length. If a beam  $\frac{1}{2}$  foot wide,  $\frac{1}{3}$  foot high, and 10 feet long can support 12 tons, find how much a similar beam can support if the beam is  $\frac{2}{3}$  foot wide,  $\frac{1}{2}$  high, and 16 feet long.

A. 7.5

B. 15

C. 18

D. 22.5

12. Solve for  $b_2$ :  $A = \frac{1}{2}h(b_1 + b_2)$

A.  $\frac{2A - b_1}{h}$

B.  $\frac{A - h}{2b_1}$

C.  $2Ah - b_1$

D.  $\frac{2A - hb_1}{h}$

13. Simplify:  $2x^2y\sqrt[3]{2x} + 7x^2\sqrt[3]{2xy^3} - 4\sqrt[3]{16x^7y^3}$

A.  $x^6y^3\sqrt[3]{2x}$

B.  $x^2y\sqrt[3]{2x}$

C.  $9x^2y\sqrt[3]{2x} - 8y\sqrt[3]{2x^7y}$

D.  $2x^3y$

14. Simplify:  $i^{74}$

A.  $i$

B.  $-1$

C.  $-i$

D.  $1$

15. Solve for x:  $\frac{1}{x-2} + \frac{3}{x+3} = \frac{4}{x^2 + x - 6}$

A.  $\frac{4}{7}$

B. 1

C.  $\frac{7}{4}$

D. 3

16. Solve:  $x^3 - 5x - 2x^2 + 10 = 0$

A.  $-2, \pm\sqrt{5}$

B.  $\pm\sqrt{5}$

C.  $2, \sqrt{5}$

D.  $2, \pm\sqrt{5}$

17. Factor completely:  $3x^4 - 48$

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

B.  $3(x-2)^4$

C.  $3x^2(x-4)^2$

D.  $3(x^2+4)(x+2)(x-2)$

18. Add, then simplify:  $\frac{2}{x^2-9} + \frac{5}{x^2-x-12}$

A.  $\frac{7}{(x^2-9)(x^2-x-12)}$

B.  $\frac{7x^2-x-21}{(x^2-9)(x^2-x-12)}$

C.  $\frac{7x-7}{(x-3)(x+3)(x-4)}$

D.  $\frac{7x-23}{(x-3)(x+3)(x-4)}$

19. Solve this system:  $\begin{cases} 2y^2 - 3x = 0 \\ 4y - x = 6 \end{cases}$

A. (6, 3)

B. (3, 6)

C. (-3, 6)

D. (-6, 3)

20. The interior of a cubical box, including the lid, is lined with insulating material  $\frac{1}{2}$  cm. thick.

Find the length of an original side of the cube if the volume is thereby decreased by  $271 \text{ cm}^3$ .

A. 8 cm

B. 10 cm

C. 12 cm

D. 15m

21. Solve this equation.  $\frac{\sqrt{x+1} + \sqrt{x-1}}{\sqrt{x+1} - \sqrt{x-1}} = 3$

A. 3

B.  $\frac{4}{3}$

C. 5

D.  $\frac{5}{3}$

22. Solve for x:  $2x^2 - 5x = x^2 + 1$

A. 0, 5

B.  $\frac{4}{11}$

C.  $\frac{5 \pm \sqrt{29}}{2}$

D.  $\frac{-5 \pm \sqrt{21}}{2}$

23. Write the equation of the line that connects the center of the **circle**  $x^2 + y^2 - 6x + 4y + 6 = 0$  with the vertex of the **parabola**  $y = 2x^2 - 4x + 5$ .

A.  $5x + 2y = 11$

B.  $x - 4y = -11$

C.  $2x - 5y = 11$

D.  $2x + 5y = 11$

24. Solve for y:  $y^{\frac{2}{3}} - y^{\frac{1}{3}} - 6 = 0$

A. 8, 27

B.  $\sqrt[3]{3}, \sqrt[3]{2}$

C. -8, 27

D.  $\sqrt[3]{3}, \sqrt[3]{-2}$

25. Write in a + bi form.  $\frac{3 - 5i}{2 - i}$

A.  $\frac{1}{3}$

B.  $\frac{1}{3} - \frac{13}{3}i$

C.  $\frac{11}{5} - \frac{7}{5}i$

D.  $\frac{34}{11}$

## Answer Key

1. B
2. B
3. A
4. A
5. B
6. C
7. C
8. B
9. B
10. B
11. D
12. D
13. B
14. B
15. C
16. D
17. D
18. D
19. A
20. B
21. D
22. C
23. A
24. C
25. C