

## Advanced Mathematics Placement Test

### SAMPLE PROBLEMS

This booklet contains sample problems for the Advanced Mathematics Placement Test (MPT-A) offered by the Academic Placement Testing Program (APTP). The collection is NOT intended to serve as a practice test but only to provide test takers with an idea of the content and difficulty of the MPT-A. The correct answers to the problems are shown on the last page of the booklet.

The Advanced Mathematics Placement Test (MPT-A) was developed to cover the following selected topics:

Absolute Value	Linear Graphs and Functions
Basic Algebraic Operations	Logarithms and Exponential Functions
Exponents and Roots	Proportions
Factoring	Quadratic Graphs and Functions
Functional Notation	Right Triangle Trigonometry
Geometry	Simplifying
Graph Interpretation	Systems of Equations
Inequalities	



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1.  $\sqrt{3} - \sqrt{27} + 5\sqrt{12} =$

a.  $-5\sqrt{12}$

b.  $8\sqrt{3}$

c.  $12\sqrt{3}$

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2.  $\frac{3^{-1}x^2y^{-1}}{9x} =$

a.  $\frac{x}{27y}$

b.  $\frac{1}{3xy}$

c.  $\frac{27y}{x}$

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3.  $\frac{3}{a} + \frac{5}{ab} =$

a.  $\frac{8}{a+ab}$

b.  $\frac{25}{a^2b}$

c.  $\frac{3b+5}{ab}$

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4.  $\left(\frac{3a^2b^{-1}}{c}\right)^{-3} =$

a.  $\frac{a^6b^3}{27c^3}$

b.  $\frac{b^3c^3}{27a^6}$

c.  $\frac{9b^3c^3}{a^6}$

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5. For  $x \geq 0$ ,  $\sqrt{9x^3} - \sqrt{4x} =$

a.  $\sqrt{3x} - 4$

b.  $x\sqrt{9x-4}$

c.  $\sqrt{x}(3x-2)$

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6.  $\frac{\frac{1}{a} - \frac{1}{b}}{\frac{1}{a} + \frac{1}{b}} =$

a.  $\frac{a-b}{a+b}$

b.  $\frac{b-a}{b+a}$

c.  $\frac{1}{a^2-b^2}$

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7.  $\frac{x^{3a-1}}{x^{a+2}} =$

a.  $x^{2a-3}$

b.  $x^{4a+1}$

c.  $2a-3$

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8.  $\frac{3x-1}{x+1} - \frac{x}{x-1} =$

a.  $\frac{2x^2-5x+1}{x^2-1}$

b.  $\frac{3(x-1)^2}{-x(x+1)}$

c.  $\frac{4x^2-3x-1}{x+1}$

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9.  $(16a^8b^{-4})^{\frac{1}{4}} =$

a.  $\frac{a^2}{2b}$

b.  $\frac{2a^2}{b}$

c.  $\frac{4a^2}{b}$

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10. Density is the mass of a substance divided by its volume. What is the volume in cubic centimeters of a mass of 300 grams having a density of 60 grams per cubic centimeter?

a. .20

b. 5

c. 18,000

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11. In a room with 90 students, there are 4 times as many women as men. How many women are in the room?

a. 18

b. 72

c. 75

---

12. For what value of  $t$  does  $\frac{2t+1}{t-3} = 1$ ?

a.  $-4$

b.  $-\frac{2}{3}$

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

---

13. If  $x + \frac{bx}{c} = a$ , and  $b \neq -c$ , then  $x =$

a.  $\frac{a}{b-c}$

b.  $\frac{a}{b+c}$

c.  $\frac{ac}{b+c}$

---

14. If  $x \neq 2$  and  $(x+2)^2(x-1) + 3(x+2)(x-1) = (x+2)P$ , then  $P =$

a.  $(x-1)(x+2)$

b.  $(x-1)(x+5)$

c.  $(x-1)^2$

---

15. One of the roots of  $x^2 - 3x + 1 = 0$  is:

a.  $\frac{-3 + \sqrt{13}}{2}$

b.  $\frac{1 - \sqrt{5}}{2}$

c.  $\frac{3 + \sqrt{5}}{2}$

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16. What is the value of  $x$  in the following system of equations?

$$x + 3y = 17$$

$$4x - y = 3$$

a.  $x = 2$

b.  $x = 3$

c.  $x = 5$

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17. Suppose that you have 12 coins, all nickels (5 cents apiece) and dimes (10 cents apiece) with a total value of \$1.00. If  $x$  is the number of nickels in your pocket and  $y$  is the number of dimes, then which of the following systems of equations can be used to determine  $x$  and  $y$ ?

a.  $5x + 10y = 100$   
 $x + y = 12$

$x + y = 100$   
 $5x + 10y = 12$

$10x + 5y = 100$   
 $x + y = 12$

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18.  $\frac{1}{(a+1)(a+2)} - \frac{1}{(a+2)(a+3)} + \frac{1}{(a+1)(a+3)} =$

a.  $\frac{1}{(a+1)(a+2)(a+3)}$

b.  $\frac{a+6}{(a+1)(a+2)(a+3)}$

c.  $\frac{a+4}{(a+1)(a+2)(a+3)}$

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19. If  $f(x) = 2x^2 - x + 5$  then  $f(a+1) =$

a.  $2a^2 + 3a + 6$

b.  $2a^2 + 5a + 8$

c.  $4a^2 + 3a + 6$

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20. If  $f(x) = \frac{3}{x-2}$ , for what value of  $x$  does  $f(x) = 6$

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

b.  $\frac{3}{2}$

c.  $\frac{5}{2}$

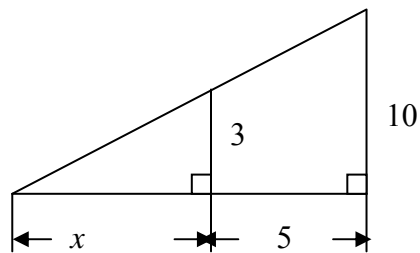
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21. In the figure to the right  $x =$

a.  $\frac{7}{5}$

b.  $\frac{3}{2}$

c.  $\frac{15}{7}$



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22. The inequality  $|x+5| > 3$  is equivalent to:

a.  $x > -2$

b.  $x < -8$  or  $x > -2$

c.  $-8 < x < -2$

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23. If the radius of a circle is tripled then the area is increased by a factor of:

a. 6

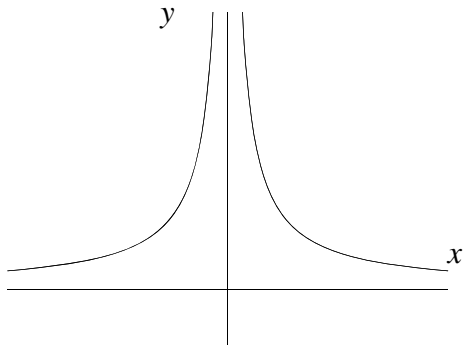
b. 9

c.  $3\pi$

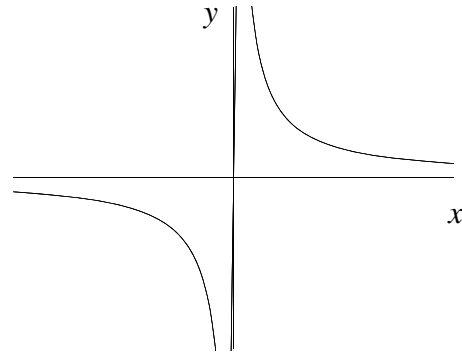
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24. Which of the following could be a portion of the graph of  $y = 1/x$ ?

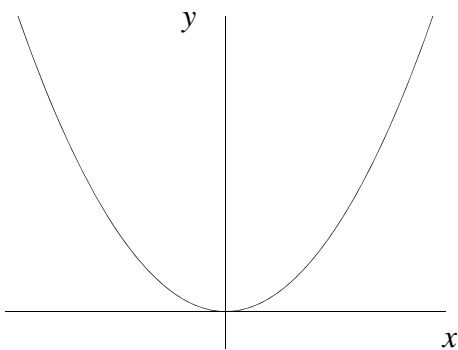
a.



b.



c.



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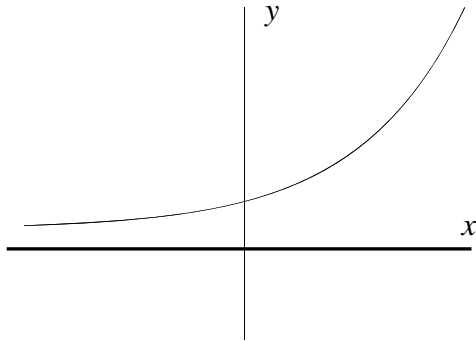
25. The graphs of the equations  $3x + 4y = -2$  and  $3x + 2y = -4$  are:

- a. the same line
- b. two intersecting lines which are not parallel
- c. two perpendicular lines

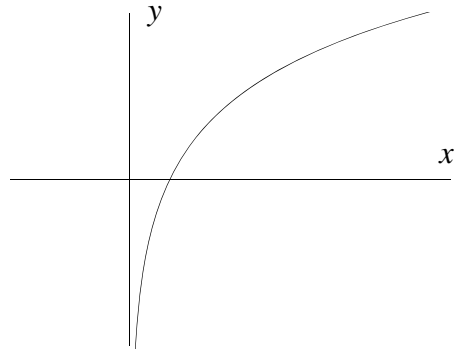
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26. Which of the following could be a portion of the graph of  $y = 2^x$  ?

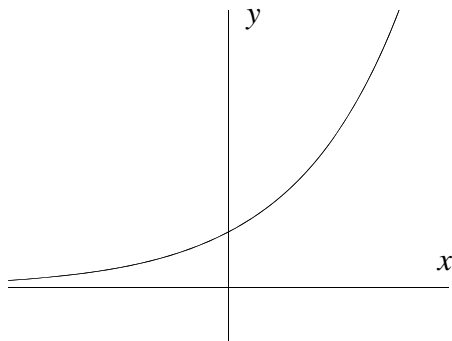
a.



b.



c.



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27.  $\cos(-\theta) =$

a.  $-\cos \theta$

b.  $\cos \theta$

c.  $\sin \theta$

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28. The inequality  $5 - 4x > 2$  is equivalent to:

a.  $x < 3/4$

b.  $x < 7/4$

c.  $x > 3/4$

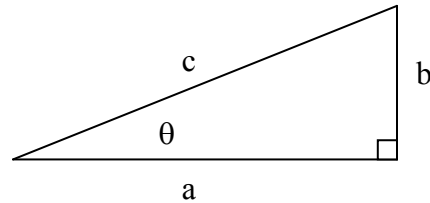
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29. In the figure to the right  $\sin \theta \tan \theta =$

a.  $\frac{a^2}{cb}$

b.  $\frac{b}{c}$

c.  $\frac{b^2}{ca}$



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30.  $\sin(\theta - \pi) =$

a.  $\cos \theta$

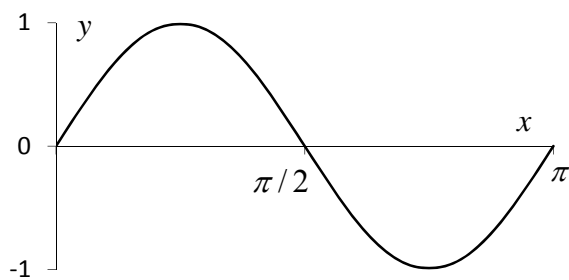
b.  $-\sin \theta$

c.  $\sin \theta$

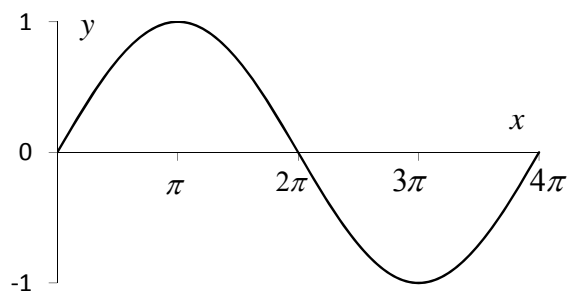
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31. Which of the following best represents a portion of the graph of  $y = \sin 2x$ ?

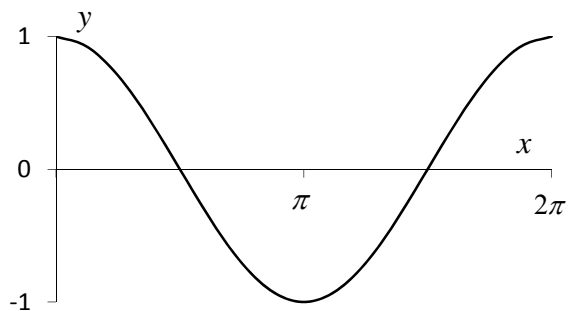
a.



b.



c.



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32.  $\log_3 81 =$

a. 4

b. 9

c. 27

---

33.  $\log_5(25 \cdot 5^{-3}) =$

a. -5

b. -1

c. 5

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34. If  $\log m + \log y = \left(\frac{2}{3}\right) \log x$ , then  $m =$

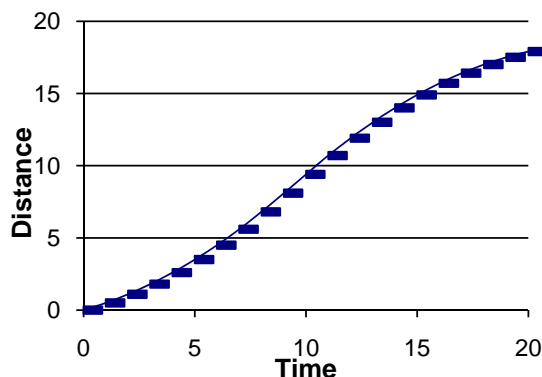
a.  $x^{\frac{2}{3}} - y$

b.  $\frac{x^{\frac{2}{3}}}{y}$

c.  $\frac{2}{3}(x/y)$

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35. The following below shows Martha's distance as a function of time as she drives between two points. Based on the information in the graph, which of the following statements is true?



a. Martha increases her speed during the entire time.

b. Martha at first increases her speed and then decreases it.

c. Martha at first decreases her speed and then increases it.

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36.  $\frac{a^2 - b^2}{\left[\left(\frac{a}{b}\right) - \left(\frac{b}{a}\right)\right]} =$

a.  $ab$

b.  $b - a$

c.  $(a - b)/(b - a)$

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37. A rectangle has an area of 48 square inches. Its base is 6 inches. What is the length of its diagonal?

a. 8 inches

b. 10 inches

c.  $(\sqrt{48})/6$  inches

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38. The wedding photographer for the Smith/Jones wedding charges \$1,000 for her preparation and first 60 prints. The cost is \$2.00 per photo for photos beyond the first 60. Which formula should be used to determine the total cost,  $C$ , as a function of the number of photos,  $p$ , that are purchased, assuming at least 60 are purchased?

a.  $C = 1000p + 2$

b.  $C = 1000(2p - 60)$

c.  $C = 1000 + 2(p - 60)$

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39. If  $f(0) = -2$  and  $f(x + 2) - f(x) = 5$ , and  $f(x)$  is linear, which of the following is the equation for  $f(x)$ ?

a.  $f(x) = -2x + (5/2)$

b.  $f(x) = (5/2)x - 2$

c.  $f(x) = 5x + 2$

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40. Given the table below, choose the correct linear function for  $f(x)$

$x$	$f(x)$	$1/f(x)$	$2f(x)$
-2	13		
-1			20
0		1/7	
+1	4		

a.  $f(x) = -7x + 13$

b.  $f(x) = -3x + 7$

c.  $f(x) = x + 1/7$

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41. A mathematical model for the Future Value of a savings account earning interest that is compounded continuously is given by the equation  $FV = Pe^{rt}$ , where  $FV$  is the amount after  $t$  years,  $P$  is the principal amount invested at  $t = 0$ , and the principal is assumed to grow continuously at a rate,  $r$ . How many years will it take the principal to triple if the annual rate is 12%?

a.  $\ln 3/0.12$

b.  $3e^{0.12}$

c.  $0.12 \log_{10} e$

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42. Select the largest set of criteria that are met by  $f(x) = \sqrt{(x + 2)}$ .

(1)  $f(x)$  is continuous for  $(-2, 7]$ .

(2)  $f(x)$  is increasing for  $[3, 5]$ .

(3) The domain of  $f(x)$  is  $[-2, \infty)$ .

(4) The range of  $f(x)$  is  $[-2, \infty)$ .

a. (2) only

b. (1),(2),(3)

c. (1),(2),(3),(4)

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43. For any  $a > 0$  and  $b > 0$ ,  $\log(a \cdot b) =$

a.  $\log(a) \cdot \log(b)$

b.  $\log(a + b)$

c.  $\log(a) + \log(b)$

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44. What are the values of  $x$  for which  $(x - 2)(x + 5) > 0$ ?

a.  $-5 < x < 2$

b.  $x > 0$

c.  $x < -5$  and  $x > 2$

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45. If  $\log_2(x) + \log_2(y) = 4$ , then  $xy =$

a. 2

b. 4

c. 16

## CORRECT ANSWERS

- |       |       |       |
|-------|-------|-------|
| 1. b  | 21. c | 41. a |
| 2. a  | 22. b | 42. b |
| 3. c  | 23. b | 43. c |
| 4. b  | 24. b | 44. c |
| 5. c  | 25. b | 45. c |
| 6. b  | 26. c |       |
| 7. a  | 27. b |       |
| 8. a  | 28. c |       |
| 9. b  | 29. c |       |
| 10. b | 30. b |       |
| 11. b | 31. a |       |
| 12. a | 32. a |       |
| 13. c | 33. b |       |
| 14. b | 34. b |       |
| 15. c | 35. b |       |
| 16. a | 36. a |       |
| 17. a | 37. b |       |
| 18. c | 38. c |       |
| 19. a | 39. b |       |
| 20. c | 40. b |       |