

## Pre-Calculus Merten Hasse 2004

Name \_\_\_\_\_

1. Give the domain of the function:  $f(x) = \sqrt{19 - x}$ 
  - a)  $x \neq 19$
  - b)  $x > \sqrt{2}$
  - c)  $x \leq 19$
  - d) None of the above
2. Find the inverse of the one-to-one function:  $f(x) = \sqrt[3]{x + 3}$ 
  - a)  $f^{-1}(x) = \frac{1}{\sqrt[3]{x+3}}$
  - b)  $f^{-1}(x) = \frac{1}{x^3-3}$
  - c)  $f^{-1}(x) = x^3 - 3$
  - d) None of the above
3. Solve the equation  $2x^2 + 6x = -1$ 
  - a)  $\left\{\frac{-6-\sqrt{7}}{2}, \frac{-6+\sqrt{7}}{2}\right\}$
  - b)  $\left\{\frac{-3-\sqrt{11}}{2}, \frac{-3+\sqrt{11}}{2}\right\}$
  - c)  $\left\{\frac{-3-\sqrt{7}}{2}, \frac{-3+\sqrt{7}}{2}\right\}$
  - d) None of the above
4. Use reference angles to find the exact value of the expression:  $\tan\left(\frac{-7\pi}{4}\right)$ 
  - a)  $\sqrt{3}$
  - b) 1
  - c) -1
  - d) None of the above
5. Let  $|x| \leq 1$ . Write  $\cos(\sin^{-1} x)$  as an expression in  $x$ 
  - a)  $\sqrt{1 - x^2}$
  - b)  $\frac{\sqrt{x^2+1}}{x}$
  - c)  $\sqrt{x^2 + 1}$
  - d) None of the above
6. Solve the linear inequality  $\left|\frac{2x+6}{3}\right| < 2$ . Express the solution set using interval notation.
  - a)  $(-6, 6)$
  - b)  $(-\infty, -6)$  or  $(0, \infty)$
  - c)  $(-6, 0)$
  - d) None of the above
7. Use trigonometric identities to find the exact value:  $\sin 15^\circ \cos 105^\circ + \cos 15^\circ \sin 105^\circ$ 
  - a)  $\frac{1}{4}$
  - b)  $\frac{-1}{2}$
  - c)  $\frac{\sqrt{3}}{2}$
  - d) None of the above
8. Complete the identity:  $\frac{1}{\cot^2 \theta} + \sec \theta \cos \theta = ?$ 
  - a)  $\sec^2 \theta$
  - b) 1
  - c)  $\csc^2 \theta$
  - d) None of the above

9. Find an equation for the line that passes through (2,5) and is parallel to the line whose equation is  $y = -\frac{1}{3}x + 9$ .
- a)  $y = \frac{1}{3}x - \frac{17}{3}$       b)  $y = -\frac{1}{3}x - \frac{17}{3}$
- c)  $y = -3x - 17$       d) None of the above
10. Solve the equation on the interval  $[0, 2\pi]$ :  $\sin^2 x - \cos^2 x = 0$
- a)  $x = \frac{\pi}{4}, \frac{\pi}{6}$       b)  $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$
- c)  $x = \frac{\pi}{4}, \frac{\pi}{3}$       d) None of the above
11. Write the complex number in polar form:  $4i$
- a)  $4(\cos 0^\circ + i \sin 0^\circ)$       b)  $4(\cos 270^\circ + i \sin 270^\circ)$
- c)  $4(\cos 90^\circ + i \sin 90^\circ)$       d) None of the above
12. Find and simplify the difference quotient  $\frac{f(x+h) - f(x)}{h}, h \neq 0$  for the function  $f(x) = 2x + 1$
- a)  $\frac{2(h+1)}{h}$       b) 2
- c)  $\frac{h+2}{h}$       d) None of the above
13. Let  $f(x) = \frac{x-3}{2}$  and  $g(x) = 2x + 3$ . Find  $(g \circ f)(x)$
- a)  $x - \frac{3}{2}$       b)  $2x + 3$
- c)  $x$       d) None of the above
14. Find the inverse of the one-to-one function  $f(x) = \frac{5x+7}{8}$ .  $f^{-1}(x) =$
- a)  $\frac{8x-7}{5}$       b)  $\frac{8x+7}{5}$
- c)  $\frac{8}{5x-7}$       d) None of the above
15. Write the first four terms of the sequence defined by the recursion formula:  
 $a_1 = 1$  and  $a_n = a_{n-1} - 4$  for  $n \geq 2$
- a) 1, 5, 9, 13      b) 1, -3, -7, -11
- c) 1, -1, -5, -9      d) None of the above
16. Write the first four terms of the sequence whose general term is given:  $a_n = \frac{4(n+1)!}{n!}$
- a) 8, 6,  $\frac{8}{3}, \frac{5}{6}$       b) 8, 12, 16, 20
- c) 8, 6,  $\frac{16}{3}, 5$       d) None of the above

17. The sum of two numbers is 24. Express the product of the numbers,  $P$ , as a function of one of the numbers  $x$ .
- a)  $P = x(24 - x)$       b)  $P = 2(24 - x)$
- c)  $P = (24 - x)^2$       d) None of the above
18. Evaluate:  $\frac{6!}{3!3!}$
- a) 20      b) 10
- c) 40      d) None of the above
19. The distance that an object falls when it is dropped is directly proportional to the square of the amount of time since it was dropped. An object falls 512 feet in 4 seconds. Find the distance the object falls in 5 seconds
- a) 20 feet      b) 640 feet
- c) 160 feet      d) None of the above
20. Evaluate:  $\sum_{i=3}^5 (i^2 + 4)$
- a) 75      b) 36
- c) 62      d) None of the above
21. Let  $\theta$  be an angle in standard position. Name the quadrant in which the angle  $\theta$  lies if  $\sin(\theta) > 0$ , and  $\cos(\theta) < 0$ .
- a) Quadrant I      b) Quadrant II
- c) Quadrant III      d) None of the above
22. Write the first five terms of the arithmetic sequence whose first term,  $a_1$ , and common difference,  $d$ , are given as:  $a_1 = \frac{2}{3}; d = \frac{1}{6}$
- a)  $\frac{2}{3}, \frac{1}{2}, \frac{1}{3}, \frac{1}{6}, 0$       b)  $\frac{2}{3}, \frac{4}{3}, 2, \frac{8}{3}, \frac{10}{3}$
- c)  $\frac{2}{3}, \frac{5}{6}, 1, \frac{7}{6}, \frac{4}{3}$       d) None of the above
23. Write the first five terms of the geometric sequence whose first term,  $a_1$ , and common ratio,  $r$ , are given as:  $a_1 = -8; r = -4$
- a)  $-8, 32, -128, 512, -2048$       b)  $-8, -12, -16, -20, -24$
- c)  $-8, -32, -128, 512, -2048$       d) None of the above
24. Determine the amplitude of the function  $y = 5 \cos\left(\frac{x}{3}\right)$
- a)  $6\pi$       b) 5
- c)  $\frac{1}{3}$       d) None of the above

25. Determine the period of the function  $y = \sin(5x)$
- a)  $2\pi$     b) 5
- c)  $\frac{2\pi}{5}$     d) None of the above
26. Evaluate:  $\binom{10}{4}$  that is the number of combinations taking 4 at a time from 10.
- a) 210    b) 2
- c) 151,200    d) None of the above
27. Expand the expression:  $(3x + 2)^3$
- a)  $27x^3 + 54x^2 + 36x + 8$     b)  $9x^6 + 6x^3 = 64$
- c)  $9x^2 + 12x + 4$     d) None of the above
28. On a right triangle ABC (C is the right angle), let BC=8 and AC=9. Find  $\sec(B)$
- a)  $\sec(B) = \frac{8\sqrt{145}}{145}$     b)  $\sec(B) = \frac{\sqrt{145}}{8}$
- c)  $\sec(B) = \frac{8\sqrt{145}}{9}$     d) None of the above
29. Evaluate the expression:  ${}_6P_0$
- a) 1    b) 720
- c) 60    d) None of the above
30. What is the probability that a card drawn from a regular deck of 52 cards is not a diamond?
- a)  $\frac{4}{13}$     b)  $\frac{2}{5}$
- c)  $\frac{3}{4}$     d) None of the above
31. Given  $f(x) = \frac{x + 7}{(x + 6)(x - 9)}$ , find the domain of  $f(x)$
- a)  $\{x|x \text{ is any real number}\}$     b)  $\{x|x \neq -6, x \neq -7, x \neq 9\}$
- c)  $\{x|x \neq -6, x \neq 9\}$     d) None of the above
32. Given  $f(x) = 3 \tan x$ , find the range of  $f(x)$
- a)  $\{y| -\infty < y < \infty\}$     b)  $\{y|y > 0\}$
- c)  $\{y|y \neq \pm \frac{n\pi}{2}\}$     d) None of the above

33. Given that  $5x + 2y + z = -11$   
 $2x - 3y - z = 17$ , find  $x + y + z$ .  
 $7x + y + 2z = -4$
- a)  $-5$     b)  $1$
- c)  $-1$     d) None of the above
34. Evaluate  $\log_{1/3}(9)$
- a)  $2$     b)  $-2$
- c)  $-4$     d) None of the above
35. Find the quotient  $Q$  and remainder  $R$  of  $(-2x^3 - 6x^2 + 7x - 4) \div (x - 1)$
- a)  $Q = 2x^2 - 8x - 1$ , and  $R = -5$     b)  $Q = 2x^2 - 8x - 1$ , and  $R = 5$
- c)  $Q = -2x^2 - 8x - 1$ , and  $R = -5$     d) None of the above
36. Find the sum of solutions to  $2^{2x-1} - 2^{x-1} - 1 = 0$
- a)  $1$     b)  $0$
- c)  $5$     d) None of the above
37. Find the coefficient for  $x^2y^3$  term of the expansion  $(-x + 2y)^5$
- a)  $10$     b)  $80$
- c)  $-10$     d) None of the above
38. Find the solution set to the inequality  $\frac{1}{x+1} > \frac{2}{x-1}$
- a)  $(-\infty, -3)$     b)  $(-3, -1)$
- c)  $(-3, -1)$  or  $(1, \infty)$     d) None of the above
39. Solve for  $x$ :  $\log_2(x+2) - \log_2(x) = \log_2(6x-1)$
- a)  $\frac{1 \pm \sqrt{13}}{6}$     b)  $\frac{1 + \sqrt{13}}{6}$
- c)  $\frac{1 + \sqrt{13}}{2}$     d) None of the above
40. Let  $A = \begin{bmatrix} x & y \\ y & x \end{bmatrix}$  then for what values of  $x$  and  $y$  will  $A^2 = A$
- a)  $x = 0$ , and  $y = 1$     b)  $y = x$
- c)  $x = -y$     d) None of the above

41. Find the equation of the circle where the end points of a diameter are  $(-3, 5)$  and  $(-1, 1)$
- a)  $(x - 2)^2 + (y - 3)^2 = 5$     b)  $(x + 2)^2 + (y - 3)^2 = 20$
- c)  $(x + 2)^2 + (y - 3)^2 = 5$     d) None of the above
42. Express  $\frac{2+i\sqrt{2}}{3-i\sqrt{2}}$  in the  $a + bi$  form
- a)  $\frac{4}{11} + \frac{5\sqrt{2}}{11}i$     b)  $\frac{4}{7} + \frac{5\sqrt{2}}{7}i$
- c)  $\frac{8}{7} + \frac{5\sqrt{2}}{7}i$     d) None of the above
43. If  $x$  is positive and  $y$  is not positive, which of the following MUST be true?
- a)  $xy < x - y$     b)  $xy < y$
- c)  $xy < 0$     d) None of the above
44. A certain set has 5 elements. How many proper subsets does it have? (Note that the empty set is not a proper subset.)
- a) 32    b) 30
- c) 31    d) None of the above
45. Let  $A = \ln(3)$  and  $B = \ln(2)$ . Express  $\log_4(\sqrt{3})$  in terms of  $A$  and  $B$
- a)  $\frac{4A}{B}$     b)  $\frac{A}{4B}$
- c)  $\frac{A}{2B}$     d) None of the above
46. Find the probability that a family with three children has at least one female child
- a)  $\frac{2}{3}$     b)  $\frac{7}{8}$
- c)  $\frac{1}{2}$     d) None of the above
47. Find radian measure of an angle of  $580^\circ$
- a)  $\frac{15\pi}{9}$     b)  $\frac{12\pi}{9}$
- c)  $\frac{11\pi}{9}$     d) None of the above
48. What is the maximum of the function  $f(x) = -x^2 - 6x$
- a) 0    b) 6
- c) 8    d) None of the above
49. Solve  $3 \log_5(x) = 4$
- a)  $5^{\sqrt[3]{5}}$     b)  $5\sqrt{5}$
- c)  $25\sqrt{5}$     d) None of the above

50. Evaluate  $\cot(\sin^{-1}(\frac{4}{5}))$

a)  $\frac{4}{3}$       b)  $\frac{4}{5}$

c)  $\frac{3}{4}$       d) None of the above

## Solutions

1	C	26	A
2	C	27	A
3	C	28	B
4	B	29	A
5	A	30	C
6	C	31	C
7	C	32	A
8	A	33	A
9	D	34	B
10	B	35	C
11	C	36	A
12	B	37	B
13	C	38	D
14	A	39	B
15	B	40	D
16	B	41	C
17	A	42	A
18	A	43	A
19	D	44	B
20	C	45	B
21	B	46	B
22	C	47	D
23	A	48	D
24	B	49	A
25	C	50	C