MATH 103 PreCalculus Diagnostic Test

Success in a first year Calculus class is highly dependent on your algebra skills. The following is a self-diagnostic test to be taken by students prior to entering a Math 103 Calculus class (note that there is a separate test for students entering Math 110).

To have a valid self-assessment, follow these instructions carefully.

- Complete the following test in no more than 90 minutes.
- Do not use a calculator for any questions.
- Do not refer to books, notes, or other material while completing the test.
- Only select one answer per question.

Once you have completed all 40 questions, refer to the last page for scoring and recommendations.

1. $2\left(\dfrac{1}{4}+\dfrac{2}{3}\right)=$

a) $\dfrac{22}{24}$

b) $\dfrac{11}{6}$

c) $\dfrac{6}{7}$

d) $\dfrac{6}{14}$

e) $\dfrac{4}{7}$

2. Express $\dfrac{1}{y^2}+\dfrac{2}{x^2 y}+\dfrac{1}{x^2 y^3}$ as a single fraction:

a) $\dfrac{x^2 y+2y^2+1}{x^2 y^3}$

b) $\dfrac{4}{x^4 y^6}$

c) $\dfrac{x+2y}{x^2 y^3}$

d) $\dfrac{x^2+3y}{x^2 y^2}$

e) $\dfrac{x^4 y^4+2xy^5+x^2}{x^4 y^6}$

3. Simplify $\dfrac{\left(2xy^2\right)^3}{\left(x^2 y\right)^2}$

a) $6xy^4$

b) $8x^7 y^8$

c) $\dfrac{6y^3}{x}$

d) $\dfrac{8y^3}{x}$

e) $\dfrac{8y^4}{x}$

4. $16^{-\frac{1}{4}} \times 4^0 =$

a) -2

b) $\dfrac{1}{2}$

c) 0

d) $-\dfrac{1}{2}$

e) 2

5. The largest common factor of $3x^3y + 2x^2y^2$ is

a) $6x^3y^2$

b) $6x^5y^3$

c) x^2y

d) x^3y^2

e) $2x^2y$

6. Factor $x^2 + 2x - 8$

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

b) $(x+8)(x-1)$

c) $(x-8)(x+1)$

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

e) $(x-4)(x-2)$

7. If $x^2 - 4x + 1 = 0$, then $x =$

a) $2 + \sqrt{3}$, $2 - \sqrt{3}$

b) $-2 + \sqrt{3}$, $-2 - \sqrt{3}$

c) $2 + \sqrt{5}$, $2 - \sqrt{5}$

d) $\sqrt{3}$, $-\sqrt{3}$

e) None of the above.

8. If $|2x - 3| = 9$, then $x =$

a) -6 or 3

b) -6 or -3

c) 6 or -3

d) 6 or 3

e) None of the above.

9. If $|x-3| > 5$, then
a) $-2 < x < 8$
b) $-8 < x < 2$
c) $x < -8 \cup x > 2$
d) $x < -2 \cup x > 8$
e) $x < -8 \cup x > -2$

10. If $2x^2 - 8 \leq 0$, then
a) $x < 2$
b) $x \leq 2$
c) $x \leq -2 \; or \; x \geq 2$
d) $x \geq 2$
e) $-2 \leq x \leq 2$

11. Solve the following pair of equations for x and y : $2x - y = 5$ and $4x + y = 7$
a) $x = -2 \, , \, y = 1$
b) $x = 2 \, , \, y = -1$
c) $x = 1 \, , \, y = -3$
d) $x = -6 \, , \, y = -17$
e) $x = 2 \, , \, y = 1$

12. $\dfrac{\dfrac{1}{xy} - 1}{\dfrac{1}{x^2} - \dfrac{y}{x}} =$

a) $\dfrac{y}{x}$

b) $\dfrac{x}{y}$

c) $\dfrac{1-xy}{x}$

d) xy

e) $xy - 1$

13. $\dfrac{1}{2x+18} - \dfrac{x}{x^2-81} =$

a) $\dfrac{-1}{2(x-9)}$

b) $\dfrac{-3(x+3)}{2(x+9)(x-9)}$

c) $\dfrac{-1}{2(x+9)}$

d) $\dfrac{-9}{(x+9)(x-9)}$

e) $\dfrac{1-x}{(x-9)(x+7)}$

14. If $x=11$ and $y=25$, then $(x+y)^{-\frac{1}{2}} =$

a) 6

b) -6

c) $\dfrac{\sqrt{11}}{55}$

d) $\dfrac{1}{6}$

e) $-\dfrac{1}{6}$

15. Factor $16x^4 - 1$

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

b) $(4x-1)^2(4x+1)^2$

c) $(2x-1)(2x+1)(4x^2+1)$

d) $(2x-1)(2x+1)(2x^2-1)$

e) $(2x-1)(2x+1)(2x^2+1)$

16. If $\dfrac{5}{x+2} = \dfrac{5-x}{x-2} + 1$, then $x=$

a) 2
b) −8
c) 8
d) −2
e) None of the above.

17. If $f(x) = x^2 - 1$ then $f(x - 1) =$
a) $x^2 - 2$
b) $x^2 - 2x - 2$
c) $x^2 - x$
d) $x^2 - 2x$
e) x^2

18. Let $f(x) = x - 2x^2$ and $g(x) = 1 - 2x$. Evaluate $g(f(x)) =$
a) $1 - x - 2x^2$
b) 0
c) $6x - 1 - 8x^2$
d) $x - 2$
e) $1 - 2x + 4x^2$

19. The graph of the equation $y = 4 - x$ is
a) a parabola with vertex $(x, y) = (1,4)$
b) a parabola with vertex $(x, y) = (-1,4)$
c) a line with slope -1 and intercept 4
d) a line with slope 4 and intercept -1
e) a circle with radius 2

20. The graph of the equation $y = 4 - x^2$ is
a) a downward opening parabola with vertex $(x, y) = (0,4)$
b) a downward opening parabola with vertex $(x, y) = (4,0)$
c) a upward opening parabola with vertex $(x, y) = (0,4)$
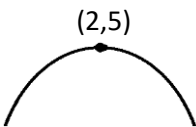d) an upward opening parabola with vertex $(x, y) = (4,0)$
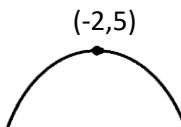e) a circle with radius 2

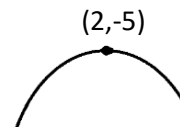21. Find the equation of the straight line through points $(x, y) = (-2,1)$ and $(x, y) = (1, -2)$.
a) $y = x - 1$
b) $y = x + 1$
c) $y = -2x + 1$
d) $y = 1 - x$
e) $y = -x - 1$

22. Find the equation of the line perpendicular to $x + 3y = 4$ through the point $(x, y) = (1,5)$.
a) $3x - y = -2$
b) $x + 3y = 16$
c) $3x + y = 8$
d) $x - 3y = -14$
e) $3x + y = 4$

23. Which graph best represents the equation $y = -x^2 - 4x + 1$?

a)   (2,5)   b)   c)   (-2,5)   d)   e)   (2,-5)

(2,5)   (-2,5)

24. The line $y = \frac{1}{2}x + 1$ intersects the parabola $y = x^2 - 4x + 3$ at
a) $x = 4$ and $x = \frac{1}{2}$
b) $x = 1$ and $x = \frac{1}{4}$
c) $x = -\frac{1}{2}$ and $x = 4$
d) $x = \frac{1}{2}$ and $x = \frac{1}{4}$
e) None of the above.

25. The parabolas $y = x^2 + 2x + 2$ and $y = -2x^2 + 8x - 7$ intersect at points $(x, y) =$
a) $(1,1)$ and $(3, -2)$
b) $(1,1)$ and $(3,17)$
c) $(-1,1)$ and $(3, -2)$
d) $(-1, -1)$ and $(3,17)$
e) none of the above

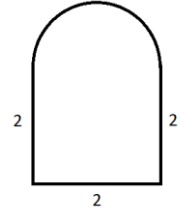26. After a 20% price decrease, the cost of an item is $4.20. What was the original price?
a) $4.40
b) $5.04
c) $5.00
d) $4.96
e) $5.25

27. Adam can shovel a driveway in two hours. Bev can shovel the same driveway in three hours. How long would it take them working together?

a) 2 hours 30 minutes
b) 2 hours 20 minutes
c) 48 minutes
d) 1 hour 12 minutes
e) 1 hour 36 minutes

28. A car leaves Regina at 1 PM and drives along Highway #1 at constant speed 85 km/h. A 2nd car leaves Regina at 1:30 PM and follows the same highway at constant speed 110 km/h. At what time will it pass the first car?

a) 1:47 PM
b) 2:07 PM
c) 2:42 PM
d) 3:12 PM
e) 3:30 PM

29. A cell phone plan costs $20 a month and includes 200 free minutes. Each additional minute costs 5 cents. Assume you use your cell phone for *at least* 200 minutes a month. If x is the total number of minutes a month, then your total cost C is given by

a) $C = 10 + .05x$
b) $C = 20x + .05$
c) $C = 20 + .05x$
d) $C = 20.05x$
e) $C = 30 + .05x$

30. Find the area of the triangle that has sides with length 3, 4, and 5.

a) 6
b) 7.5
c) 10
d) 12
e) 15

31. Find the distance between points $(x, y) = (-1, 2)$ and $(x, y) = (3, 4)$.

a) 5
b) $\sqrt{8}$
c) $\sqrt{10}$
d) $\sqrt{20}$
e) $\sqrt{40}$

32. Find the total area of the given shape, a square with side length 2 topped by a semi-circle.

a) $6 + \pi$
b) $2 + \pi$
c) $4 + 4\pi$
d) $4 + \frac{\pi}{2}$
e) $4 + \pi$

33. $log_3 81 =$

a) 3
b) 9
c) 27
d) 4
e) none of the above

34. If $\log_a 64 = 2$, then $a =$

a) -8
b) 32
c) 128
d) 4096
e) 8

35. Simplify $\log\left(xy^2\right) =$

a) $2\log(xy)$
b) $\log(x)\log(y^2)$
c) 2^{xy}
d) $\log(x) + 2\log(y)$
e) none of the above

36. If $4^{x+1} = 8$, then $x =$

a) 1
b) $\frac{1}{2}$
c) 2
d) -2
e) $\frac{-1}{2}$

37. Simplify $e^{4x-2}e^{x+1}$

a) e^{5x-1}

b) e^{4x^2+2x-2}

c) e^{3x-3}

d) e^{3x-1}

e) e^3

38. If $4^x = 40$, then

a) $x = 10$
b) $x = \sqrt[40]{4}$
c) $x = \sqrt[4]{40}$
d) $x = log_4 40$
e) $x = log_{40} 4$

39. If $log_2 x + log_2 (x-2) = 3$, then $x =$

a) 4 , -2
b) 4
c) -2
d) 2 , -4
e) None of the above

40. $log_5 \sqrt{5} =$

a) 2
b) -2
c) $\dfrac{1}{2}$
d) $\dfrac{-1}{2}$
e) 0

Answers and Scoring

The answer key is given as follows.

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

Add up your correct answers for all 40 questions.   Your score: _____ out of 40

Recommendations:

If you scored 31 or more points, you are likely ready for Calculus. However, you will want to review any areas of weakness that arose while you were working on this test. Refer to the resources section for some review suggestions.

If you scored between 20 and 30 points, and are planning to enroll in Calculus, you should definitely review relevant PreCalculus material as soon as possible. Refer to the resources section for some review suggestions. If you do not feel comfortable doing this on your own, you may wish to consider enrolling in PreCalculus Math 102 instead.

If you scored less than 20 points, you will likely have a difficult time with the material in a Calculus course and face a high probability of failure. You should consider enrolling in PreCalculus Math 102 instead.

Note: While your score on this test is a good indication of how well you might do in a Calculus class, it is of course not a guarantee of either your success or failure.

Search for More Information

The following is a list of relevant terms for each of the 40 questions in this diagnostic test. If you had difficulties with specific questions, you may wish to Google the given term below to look for useful resources, including online examples, YouTube videos, and more.

Use the quotation marks to look for the phrase when searching.

1. "fraction arithmetic"
2. "simplify algebraic expressions involving fractions"
3. "simplify algebraic expressions involving exponents"
4. "exponent arithmetic"
5. "common factors"
6. "factoring trinomials"
7. "quadratic formula"
8. "solving equations involving absolute values"
9. "solving inequalities involving absolute values"
10. "solving quadratic inequalities"
11. "solving two linear equations"
12. "simplify algebraic expressions involving complex fractions"
13. "simplify algebraic expressions involving common denominators"
14. "exponent arithmetic"
15. "difference of squares"
16. "solving rational equations"
17. "evaluating functions"
18. "function composition examples"
19. "equation of a line"
20. "equation of a parabola"
21. "equation of a line through two points"
22. "equation of a perpendicular line"
23. "finding the vertex of a parabola"
24. "intersection of line and parabola example"
25. "intersection of two parabolas"
26. "working with percentages"
27. "shared work word problems"
28. "distance speed time problems"
29. "linear cost function examples"
30. "area of triangles"
31. "distance between two points"
32. "area of squares and circles"
33. "evaluating basic logarithms"
34. "finding the base of a logarithm"
35. "log laws"
36. "solving exponential equations"
37. "base-e exponent laws"
38. "solving exponential equations"
39. "solving logarithmic equations with log laws"
40. "evaluating basic logarithms"