Diagnostic Test

Student name:

Tutorial group:

Do your best, the results of this test will be used to distribute students to different level of tutorial group (ASG, AFG, HG).

Success in calculus depends to a large extent on knowledge of the mathematics that precedes calculus. The following test is intended to diagnose weaknesses that you might have. After taking the test, you can check your answers against the given answers and, if necessary, refresh your skills by referring to the review materials that are provided by Tom Chan©.

If you have had difficulty with these problems, you may wish to consult Tom Chan© to have a review of algebra or geometry and lines.

Time allowed: 1 hour 30 minutes

This test must be answered in English.

INSTRUCTIONS

Write your name and tutorial group in the space provided on Page 1.

This paper consists of THIRTEEN questions.

Attempt ALL questions in this paper. Write your answers clearly in the space provided in this Question–Answer Book.

Unless otherwise specified, all working must be clearly shown.

Unless otherwise specified, numerical answer should be EXACT.

1 Evaluate each expression without using a calculator.

$(-3)^4$

-3^4

3^{-4}

$\dfrac{5^{23}}{5^{21}}$

$\left(\dfrac{2}{3}\right)^{-2}$

$16^{-3/4}$

2 Simplify each expression. Write your answer without negative exponents.

$\sqrt{200} - \sqrt{32}$

$(3a^3b^3)(4ab^2)^2$

$\left(\frac{3x^{3/2}y^3}{x^2y^{-1/2}}\right)^{-2}$

3 Expand and simplify.

$3(x + 6) + 4(2x + 5)$

$(x + 3)(4x - 5)$

$(\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b})$

$(2x+3)^2$

$(x+2)^3$

4 Factor each expression.

$4x^2-25$

$2x^2+5x-12$

$x^3-3x^2-4x+12$

x^4+27x

$x^3y - 4xy$

5 Simplify the rational expression.

$$\frac{x^2 + 3x + 2}{x^2 - x - 2}$$

$$\left(\frac{2x^2 - x - 1}{x^2 - 9}\right)\left(\frac{x + 3}{2x + 1}\right)$$

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

$$\frac{\frac{y}{x} - \frac{x}{y}}{\frac{1}{y} - \frac{1}{x}}$$

6 Rationalize the expression and simplify.

$$\frac{\sqrt{10}}{\sqrt{5}-2}$$

$$\frac{\sqrt{4+h}-2}{h}$$

7 Solve the equation. (Find only the REAL solutions.)

$$x+5=14-\frac{1}{2}x$$

$$\frac{2x}{x+1}=\frac{2x-1}{x}$$

$$x^2-x-12=0$$

$2x^2 + 4x + 1 = 0$

$x^4 - 3x^2 + 2 = 0$

$2x(x-4)^{-1/2} - 3\sqrt{4-x} = 0$

8 Solve each inequality. Write your answer using interval notation.

$-4 < 5 - 3x \leq 17$

$x^2 < 2x + 8$

$x(x-1)(x+2) > 0$

9 State whether each equation is TRUE or FALSE.

$(p+q)^2 = p^2 + q^2$

$\sqrt{ab} = \sqrt{a}\sqrt{b}$

$\sqrt{a^2 + b^2} = a + b$

$\frac{1+TC}{C} = 1 + T$

$\frac{1}{x-y} = \frac{1}{x} - \frac{1}{y}$

$\frac{\frac{1}{x}}{\frac{a}{x} - \frac{b}{x}} = \frac{1}{a-b}$

10 Find an equation for the line that passes through the point $(\mathbf{2}, -\mathbf{5})$ and has slope -3

is parallel to the x−axis

is parallel to the y−axis

is parallel to the line $2x - 4y = 3$

11 **Find an equation for the circle that has centre $(-1, 4)$ and passes through the point $(3, -2)$.**

12 **Let $A(-7, 4)$ and $B(5, -12)$ be the points in the plane.**
Find the slope of the line that contains A and B.

Find an equation of the line that passes through A and B. What are the intercepts?

Find the length of the segment AB.

13 Sketch the region in the xy−plane defined by the equation or inequalities.

$y = 1 - \frac{1}{2}x$

$y < 1 - \frac{1}{2}x$

$y = x^2 - 1$

$x^2 + y^2 = 4$

$-1 \leq y \leq 3$

END