注意☆試験時間は60分。

PLEASE NOTE : THE TEST PERIOD IS 60 MINUTES.
1. Fill in the following blanks with the correct answers.

(a) Find the range of \( x \) that satisfies the following inequality
\[ |x + 3| < 4x. \] The answer is ___.

(b) The number of solutions \((x, y, z)\) of the equation \(x + y + z = 4\), where \(x, y, z\) are zero or positive integers is ___.

(c) On the plane \(xy\), there are two points: \(O(0,0)\), \(A(6,8)\). The equation of the circle with a diameter of the line segment \(OA\) is \((x - 1)^2 + (y - 2)^2 = 3^2\).

(d) \(\log_4 9 = \log_2 1\), \(\log_9 4 = \log_3 2\),

hence \((\log_2 3 + \log_4 9)(\log_3 2 + \log_9 4) = ___.

(e) \(\sqrt[4]{25} \times \sqrt[5]{25} + \sqrt{5} = ___.

(f) Let the sequence \(\{a_n\}\) \((n = 1, 2, 3, \ldots)\) be a geometric progression satisfying
\(a_1 + a_2 + a_3 = 14\), \(a_2 + a_3 + a_4 = -42\). When we denote the first term of \(\{a_n\}\) by \(a\), and the common ratio by \(r\), we have \(a = 1\), \(r = 2\).

(g) Let \(\overrightarrow{a} = (1, 0, -1)\), \(\overrightarrow{b} = (-2, 2, 1)\), \(\overrightarrow{c} = (x, y, z)\) \((x > 0)\) and \(\mid \overrightarrow{c} \mid = 3\). When \(\overrightarrow{c}\) is perpendicular to both \(\overrightarrow{a}\) and \(\overrightarrow{b}\), then \(x = 1\), \(y = 2\), \(z = 3\).

(h) Let \(M\) denote the midpoint of side \(BC\) of a triangle \(ABC\).
When \(BC = 8\), \(CA = 4\), \(AB = 6\), then \(\cos \angle ABC = 1\), \(AM = 2\).

(i) The equation of the tangent to the curve \(f(x) = -x^2 + x + 2\) at the point \((0, 2)\) is \(y = 1\), and the area of the region bounded by the curve \(f(x)\), the tangent and the \(x\)-axis is 2.
2. A triangle \( \triangle ABC \) on a plane satisfies \( AC = BC \) and \( \angle ACB = 90^\circ \). \( DC = 1 \), \( \angle AH D = 90^\circ \) and \( \angle AD C = 60^\circ \). Fill in the following blanks with the correct numbers.

(1) The radius of the circumscribed circle of \( \triangle ADC = \boxed{\phantom{1}} \).

(2) The radius of the circumscribed circle of \( \triangle ABC = \boxed{\phantom{1}} \).

(3) The radius of the inscribed circle of \( \triangle ABC = \boxed{\sqrt{\phantom{1}} - \sqrt{\phantom{2}}} \times \boxed{\phantom{3}} \).

(4) \( DH = \sqrt{\phantom{1}} - \sqrt{\phantom{2}} \times \boxed{\phantom{3}} \).

(5) \( \sin \angle DAH = \boxed{\phantom{1}} - \sqrt{\phantom{3}} \times \boxed{\phantom{1}} \).

(6) \( \cos \angle DAH = \sqrt{\phantom{1}} + \sqrt{\phantom{2}} \times \boxed{\phantom{3}} \times \boxed{\phantom{1}} \). (\( \square > \square \))

3. On the plane \( xy \), there are two straight lines (1 and 2), two parabolas (3 and 4) and a circle (5) as shown in a lower figure. Choose the correct equation from (1) to (5) to satisfy each graph and fill in the blank with the number.

\[ \begin{array}{ccc}
(1) & (2) & (3) \\
5x^2 - 30y + 8x + 60 & 4x - y - 4 & x^2 + 4 + y^2 + 4y + 4 = 0 \\
5x^2 - 30y - 8x - 60 & x - 3y + 6 & x^2 + y + 4x + 4 = 0 \\
x^2 - 4x + y^2 - 4y + 4 & 5x^2 - 30y - 8x - 60 & 2x - y - 4 = 0 \\
x^2 + y - 4x - 4 & 2x - y - 4x + 4 = 0 \\
5x^2 - 30y + 8x + 60 & 2x + y + 4 = 0 & x^2 + y - 4x + 4 = 0 \\
\end{array} \]