1. Find the distance between the points \((-3, -2)\) and \((4, -1)\). Provide the exact answer in a simplified form.

\[
d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(4 - (-3))^2 + (-1 - (-2))^2} = \sqrt{(7)^2 + (1)^2} = \sqrt{49 + 1} = \sqrt{50}
\]

\[
d = \sqrt{25 \times 2}
\]

\[
\therefore d = 5\sqrt{2}
\]

2. State the Pythagorean Theorem in precise terms.

ABC is a right triangle with the right angle at B.

Given that \(b = 4\sqrt{3}\ cm\) and \(a = 6\ cm\), find \(c\). Provide the exact answer only in a simplified form.

Statement: For any right triangle, the square of the hypotenuse is equal to the sum of the squares of the legs.

\[b^2 = a^2 + c^2\]

\[
b = 4\sqrt{3} \quad (4\sqrt{3})^2 = (6)^2 + c^2
\]

\[
48 = 36 + c^2
\]

\[
\therefore c^2 = 12
\]

\[
\therefore c = \sqrt{12} = \sqrt{4 \times 3} = 2\sqrt{3}\ cm
\]

3. (a) Convert \(73^\circ 16' 53''\) into degrees and decimal degrees (three decimal places)

\[
73^\circ 16' 53'' = 73^\circ + \frac{16}{60}^\circ + \frac{53}{3600}^\circ
\]

\[
\approx 73.281^\circ
\]

(b) Convert \(135.2671^\circ\) into degrees, minutes, and seconds.

\[
135.2671^\circ = 135^\circ + 0.2671 \times 60^\prime
\]

\[
= 135^\circ + 16^\prime + 0.026 \times 60^\prime
\]

\[
= 135^\circ 16^\prime 2^\prime
\]

4. Given that the point \(P(-6, 8)\) is on the terminal side of some angle \(\theta\) in the standard position, find the exact values of all the trigonometric functions of \(\theta\). Simplify.

\[
\sin \theta = \frac{y}{r} = \frac{8}{10} = \frac{4}{5}
\]

\[
\cos \theta = \frac{x}{r} = \frac{-6}{10} = -\frac{3}{5}
\]

\[
\tan \theta = \frac{y}{x} = \frac{8}{-6} = -\frac{4}{3}
\]
Given that \( \csc \alpha = \frac{-4}{\sqrt{13}} \) with \( \alpha \) in quadrant III, find the exact values of \( \sec \alpha \) and \( \tan \alpha \). Use identities only.

Use: \( \csc^2 \alpha = 1 + \cot^2 \alpha \)

\[ \left(\frac{-4}{\sqrt{13}}\right)^2 = 1 + \cot^2 \alpha \]

\[ \frac{16}{13} = 1 + \cot^2 \alpha \]

\[ \cot^2 \alpha = \frac{16}{13} - 1 = \frac{3}{13} \]

\[ \cot \alpha = \sqrt{\frac{3}{13}} \]

\[ \sec \alpha = \frac{1}{\cos \alpha} = \frac{-\sqrt{13}}{3} = \frac{-4}{\sqrt{13}} \]

\[ \tan \alpha = \frac{1}{\cot \alpha} = \frac{-\sqrt{3}}{13} \]

---

Given that \( \cos \beta = \frac{-2}{3} \) with \( \beta \) in quadrant II, find the exact values of \( \sin \beta \) and \( \cot \beta \). Use any method.

\[ \cos \beta = \frac{-2}{3} = \frac{x}{r} \]

\[ \sin \beta = \frac{y}{r} = \frac{\sqrt{5}}{3} \]

Pick: \( x = -2 \); \( r = 3 \); \( y = ? \)

\[ x^2 + y^2 = r^2 \]

\[ (-2)^2 + y^2 = (3)^2 \]

\[ 4 + y^2 = 9 \]

\[ y = \sqrt{5} \]

\[ \cot \beta = \frac{x}{y} = \frac{-2}{\sqrt{5}} \]

---

Draw an angle of \(-450^\circ\) in the standard position. Perform a suitable \( x \)-\( y \)-\( r \) calculation to find all the trig functions of \(-450^\circ\). Must show the \( x \), \( y \), \( r \) values and the calculation details. Just the answer alone is not enough.

\[ \tan \theta = \frac{y}{x} = \frac{-1}{-1} = 1 \]

\[ \csc \theta = \frac{r}{y} = \frac{1}{-1} = -1 \]

\[ \sec \theta = \frac{r}{x} = \frac{1}{0} = \text{undefined} \]

\[ \cot \theta = \frac{x}{y} = \frac{0}{-1} = 0 \]

---

Evaluate \(-2 \cos^3(180^\circ) + 3 \sin^2(270^\circ) + 5 \cot^2(-450^\circ)\). Do this problem by hand, and show work carefully.

\[ -2 \cos^3(180^\circ) + 3 \sin^2(270^\circ) + 5 \cot^2(-450^\circ) \]

\[ = -2 [\cos(180^\circ)]^3 + 3 [\sin(270^\circ)]^2 + 5 [\cot(-450^\circ)]^2 \]

\[ = -2 (-1)^3 + 3 (-1)^2 + 5 (0)^2 \]

\[ = -2 (-1) + 3 (1) + 5 (0) \]

\[ = 2 + 3 + 0 = 5 \]

---
The equation of the terminal side of angle $\theta$ in the standard position is given by $x + 3y = 0$ with $x \leq 0$. Find the exact values of $\cot \theta$ and $\sec \theta$. Simplify.

$$y = -\frac{1}{3}x$$

$x \leq 0$

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

$x = -3; \quad y = 1; \quad r = ?$

$$r = \sqrt{x^2 + y^2} = \sqrt{(-3)^2 + 1^2} = \sqrt{9 + 1} = \sqrt{10}$$

$\cot \theta = \frac{x}{y} = \frac{-3}{1} = -3$

$\sec \theta = \frac{r}{x} = \frac{\sqrt{10}}{-3} = -\frac{\sqrt{10}}{3}$