Worksheet

Step 5: Determine the equation of the tangent to the circle.
Write down the gradient-point form of a straight line equation and substitute the gradient of the tangent and a point of tangency F(−2; 5) as can be seen in the diagram.

$$y - y_1 = m_1(x - x_1)$$

$$y - y_1 = -\tfrac{1}{4}(x - x_1)$$

Substitute F(−2; 5):

$$y - 5 = -\tfrac{1}{4}(x - (-2))$$

$$y - 5 = -\tfrac{1}{4}(x + 2)$$

$$y = -\tfrac{1}{4}x - \tfrac{1}{2} + 5$$

$$y = -\tfrac{1}{4}x + \tfrac{9}{2}$$

Step 6: Write the final answer.
The equation of the tangent to the circle at F is $y = -\tfrac{1}{4}x + \tfrac{9}{2}$.

Exercise 3

1. Determine coordinates of the midpoints of the lines joining the following points.

   1.1 (3; −3) and (−5; 1)   **1.2** (−1; −1) and (−4; 3)
   1.3 (7; 2) and (3; −5)   **1.4** (2; −1) and (3; −4)
   1.5 (3; −4) and (−2; 7)   **1.6** (7; −5) and (9; 2)
   1.7 (3; −1) and (5; −7)   **1.8** (11; −3) and (2; 0)
   1.9 (12; −9) and (10; −3)   **1.10** (−5; 9) and (−7; 8)

2. Determine the equations of the lines joining the following points.

   2.1 (0; 5) and (−3; 1)   **2.2** (4; −2) and (−3; 7)
   2.3 (−1; −8) and (2; −3)   **2.4** (−5; 2) and (2; 3)
   2.5 (7; 2) and (3; 5)   **2.6** (−5; −7) and (−8; 9)
   2.7 (−12; −13) and (−3; 5)   **2.8** (−5; 12) and (−9; 11)
   2.9 (−8; 8) and (−11; 9)   **2.10** (9; −7) and (−5; 8)

3. Determine the equations of the lines that satisfy the following conditions.

   3.1 Has the gradient −2 and passes through the point (4; −5)

   3.2 Has the gradient 3 and passes through the point (−2; 7)

   3.3 Has the gradient 5 and passes through the point (2; −3)

   3.4 Has the gradient $\tfrac{3}{4}$ and passes through the point (−7; 0)

   3.5 Has the gradient $-\tfrac{3}{2}$ and passes through the point (−3; −2)

   3.6 Parallel to the equation $y = -3x + 5$ and passes through the point (−1; 3)

   3.7 Parallel to the equation $y = \tfrac{3}{4}x - 7$ and passes through the point (−2; −5)

   3.8 Parallel to the equation $y = \tfrac{2}{5}x + 3$ and passes through the point (−1; 6)

   3.9 Parallel to the equation $y = \tfrac{3}{5}x - 2$ and passes through the point (−2; 5)

   3.10 Parallel to the equation $y = -3x$ and passes through the point (−1; 5)

   3.11 Perpendicular to the equation $y = -x - 3$ and passes through the point (2; −3)

   3.12 Perpendicular to the equation $y = \tfrac{3}{4}x - 5$ and passes through the point (−3; 2)

   3.13 Perpendicular to the equation $y = -\tfrac{1}{3}x + 4$ and passes through the point (1; 1)

   3.14 Perpendicular to the equation $y = \tfrac{2}{3}x - 7$ and passes through the point (2; 5)

   3.15 Has the gradient 3 and cuts y-axis at −1