GRADE 12
Analytical Geometry –Equations of Tangents to Circles _17 July 2020
WEBSITE NOTES ANSWERS

TOPIC:

- Equations of tangents to a circle.

Remember that a Tangent is a straight line and therefore has the equation y=mx+c. You need to determine m first, then substitute the point given in to obtain c.

REMEMBER:
Radius is ⊥ to Tangent
$m_{radius} \times m_{tangent} = -1$
m being the gradient

Example 1

Find the equation of the tangent to the circle $x^2 + y^2 = 5$ at the point (– 2; 1).

Answer

$$x^2 + y^2 = 5$$

STEP 1
Determine the Gradient (m)
Centre of circle given is (0; 0)
Therefore $mradius = m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{1-0}{-2-0} = -\frac{1}{2}$

STEP 2
Determine the Gradient of Tangent
$mradius \times mtangent = -1$

$$-\frac{1}{2} \times \text{mtangent} = -1$$
$$\text{mtangent} = 2$$

STEP 3
Determine the Equation of Tangent

$$y - y_1 = m(x - x_1)$$
$$y - (1) = 2(x - (-2))$$
$$y - 1 = 2(x + 2)$$
$$y = 2x + 4 + 1$$
$$\underline{\boldsymbol{y = 2x + 5}}$$

Example 2

Find the equation of the tangent APB which touches a circle centre C with equation $(x - 3)^2 + (y + 1)^2 = 20$ at P(5; 3).

Solution

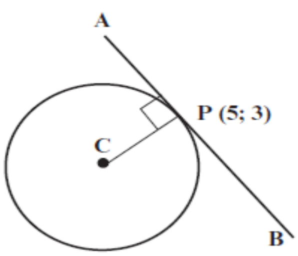
Draw a sketch to help you.

Centre of circle is C(3; –1) so the gradient of the radius CP (m_{CP})

is $\frac{3-(-1)}{5-3} = 2$.

radius ⊥ tangent, so $m_{APB} \times m_{CP} = -1$ and so

$m_{APB} = -\frac{1}{2}$



Equation of tangent: $y - y_1 = m(x - x_1)$

$y - 3 = -\frac{1}{2}(x - 5)$ P is a point on the tangent

$y - 3 = -\frac{1}{2}x + 2\frac{1}{2}$

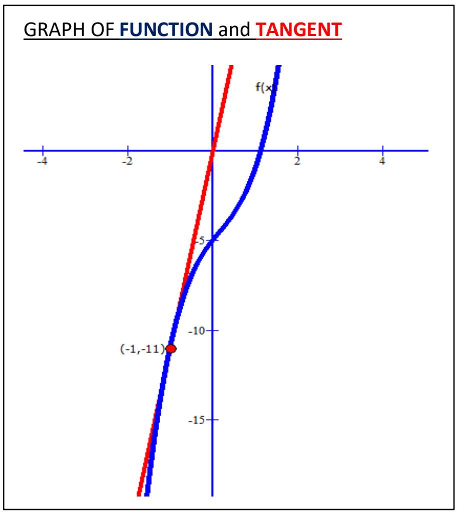
$y = -\frac{1}{2}x + 5\frac{1}{2}$

Example 3
Try the following on your own

$$Given\ \ f(x) = 2x^3 - x^2 + 3x - 5$$

Determine the equation of the tangent at the point S (-1; -11) in the form of y=……

Answer

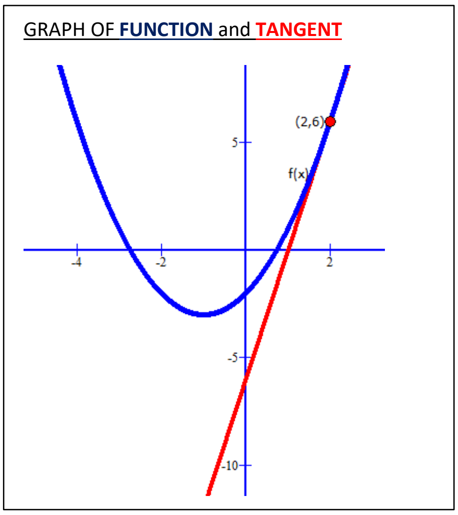


$$f'(x) = 6x^2 - 2x + 3$$
$$f'(-1) = 6.(-1)^2 - 2.(-1) + 3 = 11$$
$$y - y_1 = m(x - x_1)$$
$$y - (-11) = 11.\big(x - (-1)\big)$$
$$y + 11 = 11.(x + 1)$$
$$y + 11 = 11x + 11$$
$$y = 11x + 11 - 11$$
$$\underline{\boldsymbol{y = 11x}}$$

Example 4
Try the following on your own

$$Given\ \ f(x) = x^2 + 2x - 2$$

Determine the equation of the tangent at the point S (2; 6) in the form of y=……
Answer



$$f'(x) = 2x + 2$$
$$f'(2) = 2.(2) + 2 = 6$$
$$y - (6) = 6.(x - (2))$$
$$y - 6 = 6x - 12$$
$$\underline{\boldsymbol{y = 6x - 6}}$$