

COEDUCATION TUTORIALS

MATH 104

17/11/2019/376

SPECIAL AG: 53

For the curves in problem 1605 at the points given for

1) the equation of the tangent and 2) the equation of the normal

1) $y = 2x^2$ at the point $(1, 2)$

2) $y = 2x^2 - 2x$ at the point $(2, 1)$

3) $y = 2/x$ at the point $(-1, -1/2)$

4) $y = 16x - x^2$ at the point $(-2, 0)$

5) $y = 1/x$ at the point $(3, 1/3)$

Answer

1) $y = 2x^2$ Equation of tangent

$$\frac{dy}{dx} = 4x$$

$$m = \frac{dy}{dx} = 4x$$

$$\frac{dy}{dx} \Big|_{x=1} = 4(1) = 4$$

$$m = 4$$

$$x_1 = 1 \quad y_1 = 2$$

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

$$y - 2 = 4(x - 1)$$

$$y - 2 = 4x - 4$$

$$y = 4x - 2 \quad \text{Equation of Tangent}$$

2) Equation of the normal

$$m_1 m_2 = -1$$

$$m_2 = -1/4$$

$$y - y_1 = m_2(x - x_1)$$

$$y - 1 = -1/4(x - 2)$$

$$4y - 4 = 1 - x$$

$$4y = 1 - x + 4$$

$$4y = 5 - x$$

$$4y + x - 5 = 0$$

$$4y + x - 5 = 0$$

$$4y + x - 5 = 0$$

$$4y + x - 5 = 0$$

$$4y + x - 5 = 0$$

$$4y + x - 5 = 0$$

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$$4y + x - 5 = 0$$

3) $y = 2/x$ Equation of tangent

$$\frac{dy}{dx} = -2/x^2$$

$$\frac{dy}{dx} = -2/x^2$$

$$m = \frac{dy}{dx} \Big|_{x=-1} = -2/(-1)^2 = -2$$

$$m = -2$$

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

$$y - 1/2 = -2(x - 2)$$

$$y - 1/2 = -2x + 4$$

$$y - 1/2 = -2x + 4$$

$$y - 1/2 = -2x + 4$$

$$y - 1/2 = -2x + 4$$

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$$y - 1/2 = -2x + 4$$

① $y = x^{3/2}$ at $P(-1, -1/2)$

Equation of tangent
 $\frac{dy}{dx} = \frac{3}{2}x^{1/2}$
 $m = \frac{dy}{dx} \Big|_{x=-1} = \frac{3(-1)^{1/2}}{2} = \frac{3}{2}$

$(y - y_1) = m(x - x_1)$
 $y - (-1/2) = \frac{3}{2}(x - (-1))$
 $y + 1/2 = \frac{3}{2}(x + 1)$

$2y + 1 = 3x + 3$
 $2y - 3x - 2 = 0$

② Equation of the normal
 $m_1 m_2 = -1$
 $m_2 = \frac{1}{3/2} = -2/3$

$m_2 = -2/3$
 $(y - y_1) = m(x - x_1)$
 $y - (-1/2) = m(x - (-1))$
 $y + 1/2 = -2/3(x + 1)$

$3y + 3/2 = -2x - 2$
 $3y + 2x + 3/2 + 2 = 0$
 $3y + 2x + 7/2 = 0$

③ $y = 1 + 2 - x^2 + 6x - 2x^3$
 $\frac{dy}{dx} = 1 - 2x$

$m = \frac{dy}{dx} \Big|_{x=1} = 1 - 2(1)$
 $m = \frac{dy}{dx} \Big|_{x=0} = -1$

$y - y_1 = m(x - x_1)$
 $y - (-5) = -1(x - (-2))$
 $y + 5 = -1(x + 2)$
 $y + 5 = -x - 2$
 $y + x + 7 = 0$ Equation of Normal

④ $m_1 m_2 = -1$
 $m_2 = -1/1 = -1$

$(y - y_1) = m(x - x_1)$
 $(y - (-5)) = m(x - (-2))$
 $y + 5 = 1(x + 2)$
 $y + 5 = 1(x + 2)$
 $y + 5 = x + 2$

$y - x + 3 = 0$ Equation of Normal

⑤ $y = x^{-1}$
 $\frac{dy}{dx} = -x^{-2}$

$m = \frac{dy}{dx} \Big|_{x=1} = -1$

$(y - y_1) = m(x - x_1)$
 $(y - 1) = -1(x - 1)$
 $y - 1 = -x + 1$
 $y = -x + 2$

⑥ $m_1 m_2 = -1$
 $m_2 = -1/1/2 = -2$
 $(y - y_1) = m(x - x_1)$
 $(y - 3) = -2(x - 1)$

$y - 3 = -2x + 2$
 $y - 3 = -2x + 2$
 $y - 2 = -2x + 5$
 $y - x - 14/5 = 0$ Equation of Normal

$\frac{3m}{x}$

$\frac{3}{x}$

$$y = 1 + 2 - x^2 \text{ at } P(-2, 5)$$

$$\frac{dy}{dx} = -2x$$

$$m = \left. \frac{dy}{dx} \right|_{x=-2} = -2(-2)$$

$$m = 4$$

$$y_1 = m(x - x_1)$$

$$5 = 4(x - (-2))$$

$$5 = 4(x + 2)$$

$$5 = 4x + 8$$

$$4x + 8 = 5 \Rightarrow \text{equation of the line}$$

Line 1

$$m_1 = 4$$

$$c = -1/4 = -1$$

Line 2

$$y_2 = m_2(x - x_2)$$

$$5 = m_2(x - (-2))$$

$$5 = m_2(x + 2)$$

$$5 = m_2x + 2m_2$$

$$5 = m_2x + 2$$

$$-x + 3 = 0 \text{ equation of the normal}$$

$$\Rightarrow \text{the normal}$$

$$y = 1 + 2 - x^2 \text{ at } P(-2, 5)$$

$$y = 2 - x^2$$

$$\frac{dy}{dx} = -2x = -2(-2) = 4$$

$$m = 4$$

$$m = -1$$

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

$$(y - 5) = -1(x - (-2))$$

$$y - 5 = -1(x + 2)$$

$$y - 5 = -x - 2$$

$$x + y - 3 = 0$$

$$\Rightarrow \text{equation of the line}$$

Line 1

$$m_1 = 4$$

$$c = -1/4 = -1$$

$$m_2 = -1/4 = -1$$

$$(y - y_2) = m_2(x - x_2)$$

$$(y - 5) = -1(x - (-2))$$

$$y - 5 = -1(x + 2)$$

$$y - 5 = -x - 2$$

$$y - 3 = x - 1/5$$

$$y - 3 = x - 1/5$$

$$y - x - 14/5 = 0$$

$$\Rightarrow \text{equation of the normal}$$

8 $\frac{2}{5}$