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19/MTHSOL/048

Find the equation of the tangent and equation of the normal

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

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

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

$$m = 2(1)^2$$

$$m = 2$$

a) equation of tangent

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

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

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

$$y - 2x = -2 + 2$$

$$y - 2x = 0$$

z

b) equation of the normal

$$m_n = -\frac{1}{m} \quad m_n = -\frac{1}{2}$$

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

$$y - 2 = -\frac{1}{2}(x - 1)$$

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

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

$$2y + x = 5$$

$$\cancel{2y + x} \quad \cancel{2y + x - 5 = 0}$$

2) $y = 3x^2 - 2x$ at the point (2, 8)

$$m = \frac{dy}{dx} \Big|_{x=2}$$

$$m = \frac{dy}{dx} \Big|_{x=2} = (3x^2 - 2x)$$

$$m = 3(2)^2 - 2(2)$$

$$m = 12 - 4$$

$$m = 8$$

a) equation of tangent.

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

$$y - 8 = 8(x - 2)$$

$$y - 8 = 8x - 16$$

$$y - 8x = -16 + 8$$

$$y - 8x = -8$$

$$y - 8x + 8 = 0$$

b) equation of the normal

$$m_n = -\frac{1}{m} \quad m_n = -\frac{1}{8}$$

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

$$y - 8 = -\frac{1}{8}(x - 2)$$

$$8y - 64 = -x + 2$$

$$8y + x = 2 + 64$$

$$8y + x = 66$$

$$8y + x - 66 = 0$$

z

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3) $y = x^3/2$ at the point $(-1, -\frac{1}{2})$

$$m = \left. \frac{dy}{dx} \right|_{x=-1}$$

$$m = \left. \frac{dy}{dx} \right|_{x=-1} = \left(x^3/2 \right)$$

$$m = (-1)^3/2$$

$$m = -\frac{1}{2}$$

a) equation of the tangent.

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

$$y - (-\frac{1}{2}) = -\frac{1}{2}(x - (-1))$$

$$1 + \frac{1}{2} = -\frac{1}{2}(x + 1)$$

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

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

$$2y + x = -2$$

$$2y + x + 2 = 0$$

b) equation of the normal

$$m_1 = -\frac{1}{m} = m_1 = -1 \div -\frac{1}{2}$$

$$m_1 = 2$$

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

$$y - (-\frac{1}{2}) = 2(x - (-1))$$

$$1 + \frac{1}{2} = 2(x + 1)$$

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

multiply through by 2

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

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

$$2y - 4x - 3 = 0$$

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4) $y = 1 + x - x^2$ at the point $(-2, -5)$

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

$$m = \left. \frac{dy}{dx} \right|_{x=-2} = (1 + x - x^2)$$

$$m = 1 + (-2) - (-2)^2$$

$$m = -5$$

a) equation of the tangent

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

~~$y - y_1 = -5(x - (-2))$~~

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

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

$$y + 5x = -10 - 5$$

$$y + 5x = -15$$

$$y + 5x + 15 = 0$$

b) equation of the normal

$$m_1 = -\frac{1}{m} = m_1 = -\frac{1}{-5}$$

$$m = \frac{1}{5}$$

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

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

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

$$5y + 25 = x + 2$$

$$5y - x = 2 - 25$$

$$5y - x = -23$$

$$\underline{\underline{5y - x = -23}}$$

5) $y = \frac{1}{3}x$ at the point $(3, \frac{1}{3})$

$$m = \left. \frac{dy}{dx} \right|_{x=3} = \frac{1}{3}$$

a) equation of the tangent

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

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

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

$$3y - 1 = x - 3$$

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

$$3y - x = -2$$

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

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equation of the normal

$$m = -\frac{1}{m} \quad m_1 = -1/\frac{1}{3} \quad m = -3$$

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

$$y - \frac{1}{3} = -3x + 9$$

multiply through by 3

$$3y - 1 = -9x + 27$$

$$3y + 9x = 27 + 1$$

$$3y + 9x = 28$$

$$3y + 9x - 28 = 0$$