

Problems of Tangent and normal lines to a curve

1) Find out the tangent line to the following curves at the given points:

a) $f(x) = \sqrt{4x + 84}$, $x_0 = -5$

b) $f(x) = -3x^2 + x + 8$, $x_0 = 1$

c) $f(x) = -2x^3 + 4x^2 - 4$, $x_0 = -1$

d) $f(x) = \frac{4x}{x-2}$, $x_0 = -3$

e) $f(x) = 3x e^{x+5}$, $x_0 = -5$

f) $f(x) = 4x \ln|x + 8| + 2$, $x_0 = -7$

2) Consider the function $f(x) = 2x^2 + 2x + 6$ and the line $L: y = 10x$. Find the point on the graph of the function where the tangent line is parallel to the the line L and the equation of the tangent line.

3) Consider the function $f(x) = \sqrt{3x + 21}$ and the line $L: 3x - 12y + 58 = 0$. Find the point on the graph of the function where the tangent line is parallel to the the line L and the equation of the tangent line.

4) Consider the function $f(x) = \frac{6}{\sqrt{6x-2}}$ and the line $L: 18x + 8y - 37 = 0$. Find the point on the graph of the function where the tangent line is parallel to the the line L and the equation of the tangent line.

5) Find out the normal line to the following curves at the given points:

a) $f(x) = 2x^3 - 5x + 5$, $x_0 = -3$

b) $f(x) = \frac{5x-4}{x+9}$, $x_0 = -8$

c) $f(x) = 5x e^x$, $x_0 = 0$

d) $f(x) = 5x \ln|x - 8| - 9$, $x_0 = 9$

e) $f(x) = \sqrt{8x - 12}$, $x_0 = 6$

f) $f(x) = -4x^2 - 9x - 4$, $x_0 = -2$

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Answers:

1) a) $y = \frac{x}{4} + \frac{37}{4}$

b) $y = -5x + 11$

c) $y = -14x - 12$

d) $y = \frac{-8x}{25} + \frac{36}{25}$

e) $y = -12x - 75$

f) $y = -28x - 194$

2) (2, 18), $y = 10x - 2$

3) (5, 6), $x - 4y + 19 = 0$

4) (1, 3), $9x + 4y - 21 = 0$

5) a) $y = \frac{-x}{49} - \frac{1669}{49}$

b) $y = \frac{-x}{49} - \frac{2164}{49}$

c) $y = \frac{-x}{5}$

d) $y = \frac{-x}{45} - \frac{44}{5}$

e) $y = \frac{-3x}{2} + 15$

f) $y = \frac{-x}{7} - \frac{16}{7}$