Calculus   Name_____

Horizontal Tangents & Review

For each problem, find the points where the tangent line to the function is horizontal. Indicate if no horizontal tangent line exists.

1) $f(x) = \dfrac{3}{x-1}$

   No horizontal tangent line exits.

2) $f(x) = -\dfrac{1}{x^2 - 1}$

   $(0, 1)$

3) $f(x) = x^3 - 3x^2 + 6$

   $(0, 6), (2, 2)$

4) $f(x) = -\dfrac{2}{x-2}$

   No horizontal tangent line exits.

5) $f(x) = \dfrac{1}{x+2}$

   No horizontal tangent line exits.

6) $f(x) = -x^3 - 3x^2 - 27x - 3$

   No horizontal tangent line exits.

7) $f(x) = \dfrac{3}{x^2 - 4}$

   $\left(0, -\dfrac{3}{4}\right)$

8) $f(x) = -\dfrac{9x}{x^2 + 9}$

   $\left(-3, \dfrac{3}{2}\right), \left(3, -\dfrac{3}{2}\right)$

9) $f(x) = -x^3 + 3x^2 + 2$

   $(0, 2), (2, 6)$

10) $f(x) = (3x + 3)^{\frac{1}{2}}$

   No horizontal tangent line exits.

11) $f(x) = -\dfrac{x^2}{2x + 4}$

   $(-4, 4), (0, 0)$

12) $f(x) = -(x + 2)^{\frac{1}{3}}$

   No horizontal tangent line exits.

For each problem, find the equation of the line tangent to the function at the given point. Your answer should be in slope-intercept form.

13) $f(x) = x^3 - 2x^2 + 3$ at $(0, 3)$

$y = 3$

14) $f(x) = \dfrac{2}{x-2}$ at $\left(-2, -\dfrac{1}{2}\right)$

$y = -\dfrac{1}{8}x - \dfrac{3}{4}$

Differentiate each function with respect to x.

15) $y = \dfrac{4x^4 - 2}{5x^4 + 5}$

$\dfrac{dy}{dx} = \dfrac{(5x^4 + 5) \cdot 16x^3 - (4x^4 - 2) \cdot 20x^3}{(5x^4 + 5)^2}$

$= \dfrac{24x^3}{5x^8 + 10x^4 + 5}$

16) $y = \dfrac{5}{x^3 - 2}$

$\dfrac{dy}{dx} = -\dfrac{5 \cdot 3x^2}{(x^3 - 2)^2}$

$= -\dfrac{15x^2}{x^6 - 4x^3 + 4}$

17) $y = 5x^2(5x^5 + 3)$

$\dfrac{dy}{dx} = 5x^2 \cdot 25x^4 + (5x^5 + 3) \cdot 10x$

$= 175x^6 + 30x$

18) $y = 4x^3(-2x^3 + 4)$

$\dfrac{dy}{dx} = 4x^3 \cdot -6x^2 + (-2x^3 + 4) \cdot 12x^2$

$= -48x^5 + 48x^2$

19) $y = 2x^4 - 4x^2$

$\dfrac{dy}{dx} = 8x^3 - 8x$

20) $y = 5x^5 + 4x^4 - 4x$

$\dfrac{dy}{dx} = 25x^4 + 16x^3 - 4$

Use the definition of the derivative to find the derivative of each function with respect to x.

21) $y = 5x + 1$

$\dfrac{dy}{dx} = 5$

22) $y = 2x^2 + 4$

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

23) $y = -\dfrac{2}{2x - 5}$

$\dfrac{dy}{dx} = \dfrac{4}{4x^2 - 20x + 25}$

24) $y = \sqrt{-4x + 4}$

$\dfrac{dy}{dx} = -\dfrac{1}{\sqrt{-x + 1}}$

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