

**Calculus Practice: Using Differentiation to Find a Tangent 3b**

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

1)  $f(x) = x^2 + 2x + 1$

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

3)  $f(x) = -x^2 - 2x - 1$

4)  $y = -2x^2 + 8x - 4$

5)  $f(x) = e^{x+1}$

6)  $y = -x^3 + \frac{3x^2}{2} - 27x - 3$

7)  $y = -\frac{16x}{x^2 + 16}$

8)  $y = \ln(-x)$

9)  $y = -\frac{3}{x^2 - 25}$

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

$$11) f(x) = -2\cot(x); [-\pi, \pi]$$

$$12) y = -\frac{x^2}{2x+2}$$

$$13) y = -x^3 + 2x^2$$

$$14) y = -\frac{3}{x-4}$$

$$15) y = \csc(2x); [-\pi, \pi]$$

$$16) y = x^3 + 3x^2 + 27x - 6$$

$$17) y = -x^3 + 4x^2 - 5$$

$$18) y = -\sin(2x); [-\pi, \pi]$$

$$19) f(x) = x^3 - 4x^2 + 6$$

$$20) y = -\frac{3}{x^2-4}$$

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

1)  $f(x) = x^2 + 2x + 1$

 $(-1, 0)$ 

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

 $(4, 6)$ 

3)  $f(x) = -x^2 - 2x - 1$

 $(-1, 0)$ 

4)  $y = -2x^2 + 8x - 4$

 $(2, 4)$ 

5)  $f(x) = e^{x+1}$

No horizontal tangent line exists.

6)  $y = -x^3 + \frac{3x^2}{2} - 27x - 3$

No horizontal tangent line exists.

7)  $y = -\frac{16x}{x^2 + 16}$

 $(-4, 2), (4, -2)$ 

8)  $y = \ln(-x)$

No horizontal tangent line exists.

9)  $y = -\frac{3}{x^2 - 25}$

 $(0, \frac{3}{25})$ 

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

No horizontal tangent line exists.

11)  $f(x) = -2\cot(x)$ ;  $[-\pi, \pi]$

No horizontal tangent line exists.

12)  $y = -\frac{x^2}{2x+2}$

$(-2, 2), (0, 0)$

13)  $y = -x^3 + 2x^2$

$(0, 0), \left(\frac{4}{3}, \frac{32}{27}\right)$

14)  $y = -\frac{3}{x-4}$

No horizontal tangent line exists.

15)  $y = \csc(2x)$ ;  $[-\pi, \pi]$

$\left(-\frac{3\pi}{4}, 1\right), \left(-\frac{\pi}{4}, -1\right), \left(\frac{\pi}{4}, 1\right), \left(\frac{3\pi}{4}, -1\right)$

16)  $y = x^3 + 3x^2 + 27x - 6$

No horizontal tangent line exists.

17)  $y = -x^3 + 4x^2 - 5$

$(0, -5), \left(\frac{8}{3}, \frac{121}{27}\right)$

18)  $y = -\sin(2x)$ ;  $[-\pi, \pi]$

$\left(-\frac{3\pi}{4}, -1\right), \left(-\frac{\pi}{4}, 1\right), \left(\frac{\pi}{4}, -1\right), \left(\frac{3\pi}{4}, 1\right)$

19)  $f(x) = x^3 - 4x^2 + 6$

$(0, 6), \left(\frac{8}{3}, -\frac{94}{27}\right)$

20)  $y = -\frac{3}{x^2-4}$

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