

Write your name on this horizontal tangent line: Key

AP Calculus AB: 4.4 Critical Numbers (Horizontal & Vertical Tangent Lines)

1. Find the point(s) where there are critical values on the function $f(x) = \sqrt{9-x^2}$

$$f'(x) = \frac{-x}{\sqrt{9-x^2}} = 0$$

HTL: $-x=0$
 $x=0$

VTL: $\sqrt{9-x^2}=0$
 $9-x^2=0$
 $-x^2=-9$
 $x^2=9$
 $x=\pm 3$

$f(0)=3$
 $f(-3)=0$
 $f(3)=0$

$(0,3)$ HTL
 $(-3,0)$ VTL
 $(3,0)$ VTL

2. Find where $f(x) = (x^2 - 2)e^{2x}$ has a horizontal or vertical tangent line.

$$f'(x) = e^{2x}(2x) + (x^2 - 2)2e^{2x}$$

$$0 = e^{2x}(x+2)(x-1)$$

$e^{2x} \neq 0$ $x+2=0$ $x-1=0$

$x = -2$ $x = 1$ HTL

3. Find the x-coordinate(s) of any vertical tangent lines of the function below.

$$3xy + 5y = 25x$$

$$\frac{dy}{dx} = \frac{25-3y}{3x+5} \text{ VTL}$$

$$3x+5=0$$

$x = -\frac{5}{3}$

4. Find where there are vertical and/or horizontal tangent lines of the function

$$f(x) = x^3 + \frac{7}{2}x^2 - 20x + 12$$

$$x = \frac{5}{3} \quad x = 4$$

5. Find the critical number(s) of $g(x) = 2\sqrt[3]{x^4} - \frac{16x}{3} = 2x^{4/3} - \frac{16}{3}x$

$$g' = \frac{8}{3}x^{1/3} - \frac{16}{3}$$

$x = 8$