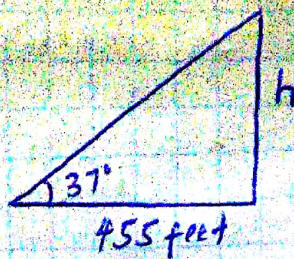


Problem 1



$$\tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{h}{455}$$

$$\tan 37^\circ = \frac{h}{455}$$

$$h = \tan 37^\circ \times 455$$

$$= 342.87 \text{ feet}$$

Problem 2

$$y = x - 30 + x^2 \quad \text{find } x \text{ and } y \text{ intercepts}$$

$$y = x^2 + x - 30$$

y -intercept occurs when $x = 0$

$$y = (0)^2 + 0 - 30$$

$$y = -30$$

$$y\text{-intercept} = (0, -30)$$

x -intercept occurs when $y = 0$

$$x^2 + x - 30 = 0$$

$$x^2 + 6x - 5x - 30 = 0$$

$$x(x+6) - 5(x+6) = 0$$

$$(x-5)(x+6) = 0$$

$$x = -6 \text{ or } x = 5$$

$$x\text{-intercepts} = (-6, 0) \text{ and } (5, 0)$$

Problem 3

$$\lim_{x \rightarrow -4} \frac{3 - \sqrt{13+x}}{x+4}$$

Rationalize the number

$$= \frac{(3 - \sqrt{13+x})(3 + \sqrt{13+x})}{(x+4)(3 + \sqrt{13+x})} = \frac{9 - 13 - x}{(x+4)(3 + \sqrt{13+x})}$$

$$= \frac{-x-4}{(x+4)(3 + \sqrt{13+x})} = - \frac{1}{3 + \sqrt{13+x}}$$

Plug in the value $x = -4$

$$= - \frac{1}{3 + \sqrt{13+4}} = - \frac{1}{3 + \sqrt{9}} = - \frac{1}{6}$$

Problem 4

$$\lim_{x \rightarrow 0} \frac{\sec(2x) \tan(2x)}{x}$$

$$\lim_{x \rightarrow 0} \left(\frac{\frac{1}{x} \tan(2x)}{\frac{1}{\sec(2x)}} \right)$$

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$$\lim_{x \rightarrow 0} \left(\frac{\frac{1}{x} \tan(2x)}{\frac{1}{\sec(2x)}} \right) =$$

Using L'Hospital's Rule

$$= \lim_{x \rightarrow 0} \left(\frac{\sec^2(2x) \cdot 2}{1} \right) = \lim_{x \rightarrow 0} \left(\frac{2}{\cos^2(2x)} \right)$$

Plug in the value $x=0$

$$= \frac{2}{\cos^2(2 \cdot 0)} = 2$$

$$\lim_{x \rightarrow 0} \left(\frac{1}{\sec(2x)} \right) = \lim_{x \rightarrow 0} \cos(2x)$$

$$= \cos(2 \cdot 0) = 1$$

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

Problem 5

$$y = \frac{8}{3x^{-3}} - \frac{2}{5x^4} + 4\cos x$$

$$\frac{d}{dx} \left(\frac{8}{3x^{-3}} \right) = \frac{8}{3} \frac{d}{dx} (x^3) = \frac{8}{3} \cdot 3x^2 = 8x^2$$

$$\frac{d}{dx} \left(\frac{2}{5x^4} \right) = \frac{2}{5} \frac{d}{dx} (x^{-4}) = \frac{2}{5} \cdot -4x^{-5} = -\frac{8}{5}x^{-5}$$

$$\frac{d}{dx} (4\cos x) = -4\sin x$$

$$= 8x^2 + \frac{8}{5}x^{-5} - 4\sin x$$

Problem 6

$$y = (x+7)^{\frac{2}{3}} + 2\sqrt{x} \text{ at a point on the curve corresponding to } x=1$$

Find the tangent point

$$y = (1+7)^{\frac{2}{3}} + 2\sqrt{1} = 8^{\frac{2}{3}} + 2 = 6$$

$$\text{tangent point} = (1, 6)$$

Find the slope of the function by taking its derivative

$$\frac{d}{dx} \left((x+7)^{\frac{2}{3}} \right) = \frac{2}{3} (x+7)^{-\frac{1}{3}}$$

$$\frac{d}{dx} (2\sqrt{x}) = 2 \frac{d}{dx} (x^{\frac{1}{2}}) = 2 \cdot \frac{1}{2} x^{-\frac{1}{2}} = \frac{1}{\sqrt{x}}$$

$$= \frac{2}{3} (x+7)^{-\frac{1}{3}} + \frac{1}{\sqrt{x}}$$

Plug $x=1$ in the equation.

$$= \frac{2}{3} (1+7)^{-\frac{1}{3}} + \frac{1}{\sqrt{1}} = \frac{1}{3} + 1 = \frac{4}{3}$$

$$m = \frac{4}{3}$$

Now find the line with slope $m = \frac{4}{3}$ passing through $(1, 6)$

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

$$y - 6 = \frac{4}{3}(x - 1)$$

$$y = \frac{4}{3}x - \frac{4}{3} + 6$$

$$y = \frac{4}{3}x + \frac{14}{3}$$

Problem 8

$$g(x) = \frac{(7x^2+2)}{x(3+x)} = \frac{(7x^2+2)}{3x+x^2}$$

~~$$g'(x) = (7x^2+2)$$~~

$$g'(x) = \frac{14x(3x+x^2) - (3+x)(7x^2+2)}{(3x+x^2)^2}$$

$$= \frac{42x^2 + 14x^3 - 21x^2 - 6 - 14x^3 - 4x}{(3x+x^2)^2}$$

$$= \frac{21x^2 - 4x - 6}{(3x+x^2)^2}$$

Problem 9.

$$y = x^2 \cos(3x^2-1)$$

$$y' = \frac{d}{dx}(x^2) \cos(3x^2-1) + \frac{d}{dx}(\cos(3x^2-1)) x^2$$

$$= 2x \cos(3x^2-1) + (-6x \sin(3x^2-1)) x^2$$

$$= 2x \cos(3x^2-1) - 6x^3 \sin(3x^2-1)$$

Problem 10

$$25xy = 12(x^2 + y^2) \text{ at the point } (3, 4)$$

To find the slope we will find implicit derivative.

$$\frac{d}{dx}(25xy) = \frac{d}{dx}(12(x^2 + y^2))$$

$$\frac{d}{dx}(25xy) = 25 \left(\frac{d}{dx}(x) y + \frac{d}{dx}(y) x \right) = 25y + 25x \frac{dy}{dx}$$

$$\frac{d}{dx} (12(x^2 + y^2)) = 12(2x + 2y \frac{dy}{dx})$$

$$25(y + xy') = 12(2x + 2yy')$$

$$25y + 25xy' = 24x + 24yy'$$

$$25xy' - 24yy' = 24x - 25y$$

$$y'(25x - 24y) = 24x - 25y$$

$$y' = \frac{24x - 25y}{25x - 24y}$$

$$m = \frac{24(3) - 25(4)}{25(3) - 24(4)} = \frac{4}{3}$$

Problem 7

$$s(t) = -4.9t^2 + v_0 t + s_0$$

$$h(t) = -9.8t + v_0$$

$$h(t) = -9.8t + 96$$