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Find the EQ of the tangent line to the graph at the given point.

$$(58) y = (x^2 + 2x)(x+1) = x^3 + x^2 + 2x^2 + 2x = x^3 + 3x^2 + 2x$$

$$y' = 3x^2 + 6x + 2 \text{ at } (1, 6)$$

$$= 3 + 6 + 2 = 11$$

$$y - 6 = 11(x - 1)$$

Find where the graph has a horizontal tangent line.

$$(64) y = \sqrt{3}x + 2 \cos x$$

$$y' = \sqrt{3} - 2 \sin x = 0$$

$$\sqrt{3} = 2 \sin x$$

$$\frac{\sqrt{3}}{2} = \sin x$$

$$x = \pi/3, 2\pi/3$$

(73) Given  $g(x) = f(x) + b$ , what is the relationship between  $f'$  and  $g'$ ?

$$g'(x) = f'(x) + 0$$

(96) Find the average rate of change over the interval. Compare to the instantaneous rate of change at the endpoints.

$$f(x) = \sin x \quad [0, \pi/6]$$

$$f(0) = 0$$

$$f(\pi/6) = 1/2$$

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{0.5 - 0}{\pi/6 - 0} = \frac{0.5}{\pi/6} = \frac{3}{\pi} \approx 0.955$$

$$f'(x) = \cos x$$

$$f'(0) = 1$$

$$f'(\pi/6) = \sqrt{3}/2 \approx 0.866$$

- (98) A ball is thrown down from a 220 ft. building with an initial velocity of 22 ft/sec. What is the velocity after 3 seconds?

$$s(t) = -16t^2 + v_0 t + s_0$$

$$s(t) = -16t^2 - 22t + 220$$

$$s'(t) = -32t - 22$$

$$s'(3) = -118 \text{ ft/sec}$$

- (118) Find  $a$  and  $b$  so the function is differentiable.

$$f(x) = \begin{cases} \cos x & x < 0 \\ ax + b & x \geq 0 \end{cases}$$

$$f'(x) = \begin{cases} -\sin x & x < 0 \\ a & x \geq 0 \end{cases}$$

$$\cos 0 = 1$$

$$ax + b$$

$$a \cdot 0 + b$$

$$0 + b = 1$$

$$b = 1$$

continuous

$$-\sin 0 = 0$$

$$a = 0$$

equal slope

- (108) Area of a square with sides of length  $s$  is  $A = s^2$ . Find the rate of change of the area with respect to  $s$  at  $s = 6$  meters.

$$A = s^2$$

$$\frac{dA}{ds} = 2s$$

$$= 2(6) = 12 \text{ m}^2/\text{perm change}$$