

Section 4.5

$$1.) f(x) = 2 \sin x - \cos x \xrightarrow{D} f'(x) = 2 \cdot \cos x - (-\sin x)$$

$$5.) f(x) = \tan x - \cot x \xrightarrow{D} f'(x) = \sec^2 x - (-\csc^2 x)$$

$$6.) f(x) = \sec x - \csc x \xrightarrow{D} f'(x) = \sec x \tan x - (-\csc x \cot x)$$

$$9.) f(x) = 2 \sin(3x+1) \xrightarrow{D} f'(x) = 2 \cdot \cos(3x+1) \cdot 3$$

$$11.) f(x) = \tan(4x) \xrightarrow{D} f'(x) = \sec^2(4x) \cdot 4$$

$$13.) f(x) = 2 \sec(1+2x) \xrightarrow{D} \\ f'(x) = 2 \cdot \sec(1+2x) \tan(1+2x) \cdot 2$$

$$14.) f(x) = -3 \csc(3-5x) \xrightarrow{D} \\ f'(x) = -3 \cdot -\csc(3-5x) \cot(3-5x) \cdot -5$$

$$17.) f(x) = \sin^3(x^2-3) \xrightarrow{D} \\ f'(x) = 3 \sin^2(x^2-3) \cdot \cos(x^2-3) \cdot 2x$$

$$18.) f(x) = \cos^2(x^2-1) \xrightarrow{D} \\ f'(x) = 2 \cos(x^2-1) \cdot -\sin(x^2-1) \cdot 2x$$

$$19.) f(x) = 3 \sin^2(x^2) \xrightarrow{D} \\ f'(x) = 3 \cdot 2 \sin(x^2) \cdot \cos(x^2) \cdot 2x$$

$$21.) f(x) = 4 \cos(x^2) - 2 \cos^2 x \xrightarrow{D} \\ f'(x) = 4 \cdot -\sin(x^2) \cdot 2x - 2 \cdot 2 \cos x \cdot -\sin x$$

$$24.) f(x) = -3 \cos^2(3x^2 - 4) \xrightarrow{D}$$

$$f'(x) = -3 \cdot 2 \cos(3x^2 - 4) \cdot -\sin(3x^2 - 4) \cdot 6x$$

$$27.) f(x) = -2 \tan^3(3x - 1) \xrightarrow{D}$$

$$f'(x) = -2 \cdot 3 \tan^2(3x - 1) \cdot \sec^2(3x - 1) \cdot 3$$

$$28.) f(x) = (\sin x)^{\frac{1}{2}} + \sin \sqrt{x} \xrightarrow{D}$$

$$f'(x) = \frac{1}{2} (\sin x)^{-\frac{1}{2}} \cos x + \cos \sqrt{x} \cdot \frac{1}{2} x^{-\frac{1}{2}}$$

$$29.) f(x) = (\sin(2x^2 - 1))^{\frac{1}{2}} \xrightarrow{D}$$

$$f'(x) = \frac{1}{2} (\sin(2x^2 - 1))^{-\frac{1}{2}} \cdot \cos(2x^2 - 1) \cdot 4x$$

$$32.) g(t) = \frac{\sin(3t)}{\cos(5t)} \xrightarrow{D}$$

$$g'(t) = \frac{\cos(5t) \cdot \cos(3t) \cdot 3 - \sin(3t) \cdot -\sin(5t) \cdot 5}{\cos^2(5t)}$$

$$37.) f(x) = \sin(2x - 1) \cdot \cos(3x + 1) \xrightarrow{D}$$

$$f'(x) = \sin(2x - 1) \cdot -\sin(3x + 1) \cdot 3 \\ + \cos(2x - 1) \cdot 2 \cdot \cos(3x + 1)$$

$$41.) f(x) = \sin x \cdot \sec x \xrightarrow{D}$$

$$f'(x) = \sin x \cdot \sec x \tan x + \cos x \cdot \sec x$$

$$44.) g(x) = \frac{1}{\sin(3x)} = \csc(3x) \xrightarrow{D}$$

$$g'(x) = -\csc(3x) \cot(3x) \cdot (3)$$

$$46.) g(x) = \frac{1}{\csc^2(5x)} = \sin^2(5x) \xrightarrow{D}$$

$$g'(x) = 2 \sin(5x) \cdot \cos(5x) \cdot 5$$

$$48.) h(x) = \cot(3x) \csc(3x) \xrightarrow{D}$$

$$h'(x) = \cot(3x) \cdot -\csc(3x) \cot(3x) \cdot 3 + -\csc^2(3x) \cdot 3 \cdot \csc(3x)$$

$$51.) h(s) = \sin^3 s + \cos^3 s \xrightarrow{D}$$

$$h'(s) = 3 \sin^2 s \cdot \cos s + 3 \cos^2 s \cdot -\sin s$$

$$54.) f(x) = \frac{1 + \cos(3x)}{2x^3 - x} \xrightarrow{D}$$

$$f'(x) = \frac{(2x^3 - x) \cdot -\sin(3x) \cdot (3) - (1 + \cos(3x)) \cdot (6x^2 - 1)}{(2x^3 - x)^2}$$

$$55.) f(x) = \tan\left(\frac{1}{x}\right) \xrightarrow{D}$$

$$f'(x) = \sec^2\left(\frac{1}{x}\right) \cdot -x^{-2}$$

$$56.) f(x) = \sec(1+x^2)^{-1} \xrightarrow{D}$$

$$f'(x) = \sec(1+x^2)^{-1} \cdot \tan(1+x^2)^{-1} \cdot -(1+x^2)^{-2} \cdot 2x$$

$$57.) f(x) = \frac{\sec(x^2)}{\sec^2 x} \xrightarrow{D}$$

$$f'(x) = \frac{\sec^2 x \cdot \sec(x^2) \tan(x^2) \cdot 2x - \sec(x^2) \cdot 2 \sec x \cdot \sec x \tan x}{\sec^4 x}$$

$$59.) y = \sin\left(\frac{\pi}{3}x\right) \xrightarrow{D} y' = \cos\left(\frac{\pi}{3}x\right) \cdot \frac{\pi}{3} = 0$$

$$(\text{horizontal tangent: } y' = 0) \rightarrow \cos\left(\frac{\pi}{3}x\right) = 0$$

$$\rightarrow \frac{\pi}{3}x = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \dots \rightarrow$$

||

$$x = \frac{\pi}{2} \div \frac{\pi}{3}, \frac{3\pi}{2} \div \frac{\pi}{3}, \frac{5\pi}{2} \div \frac{\pi}{3}, \dots \rightarrow$$

$$x = \frac{3}{2}, \frac{9}{2}, \frac{15}{2} \leftarrow > 2\pi \rightarrow$$

$$x = \frac{3}{2}, \frac{9}{2}$$

$$60.) y = \cos^2 x \xrightarrow{D} y' = 2\cos x \cdot -\sin x = 0$$

$$(\text{horizontal tangent: } y' = 0) \rightarrow$$

$$\cos x = 0 \quad \text{OR} \quad \sin x = 0$$

↓

$$x = \frac{\pi}{2}, \frac{3\pi}{2}$$

↓

$$x = 0, \pi, 2\pi$$

$$63.) D \sec x = D\left(\frac{1}{\cos x}\right) = D(\cos x)^{-1} \xrightarrow{1}$$

$$= -(\cos x)^{-2} \cdot -\sin x = \frac{\sin x}{\cos^2 x}$$

$$= \frac{1}{\cos x} \cdot \frac{\sin x}{\cos x} = \sec x \cdot \tan x$$

$$65.) f(x) = \sin \sqrt{x^2+1} \xrightarrow{D}$$

$$f'(x) = \cos \sqrt{x^2+1} \cdot \frac{1}{2}(x^2+1)^{-1/2} \cdot 2x$$

$$69.) f(x) = \sin^2(x^2-1) \xrightarrow{D}$$

$$f'(x) = 2\sin(x^2-1) \cdot \cos(x^2-1) \cdot 2x$$

$$70.) f(x) = \cos^2(2x^2 + 3) \xrightarrow{D}$$

$$f'(x) = 2 \cos(2x^2 + 3) \cdot -\sin(2x^2 + 3) \cdot 4x$$

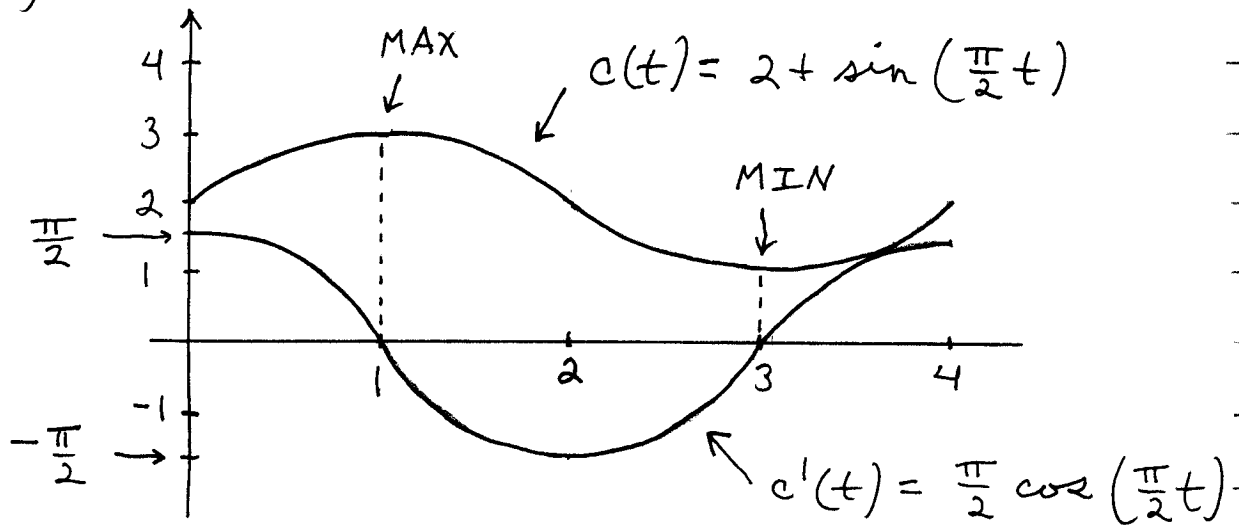
$$71.) f(x) = \tan^3(3x^3 - 3) \xrightarrow{D}$$

$$f'(x) = 3 \tan^2(3x^3 - 3) \cdot \sec^2(3x^3 - 3) \cdot 9x^2$$

$$73.) c(t) = 2 + \sin\left(\frac{\pi}{2}t\right)$$

$$a.) c'(t) = \cos\left(\frac{\pi}{2}t\right) \cdot \frac{\pi}{2}$$

b.)



$$c.) \text{ i.) } \max c(t) : c'(t) = 0$$

$$\text{ii.) } c'(t) > 0 : c(t) \text{ is } \uparrow$$

$$\text{iii.) } c'(t) = 0 \rightarrow c(t) \text{ MAX or MIN}$$