Chapter 3 Test Review All No Calculator

2. Sketch the graph of a velocity curve from the graph of the position. 3.4 #11

3. Find dy/dx for trigonometric functions. Ch Rev. #15, #3

#3

$y = 2\sin x \cdot \cos x$

$y' = 2\sin x(-\sin x) + 2\cos x \cos x$

$y' = 2\cos^2 x - 2\sin^2 x$

$y' = 2(\cos^2 x - \sin^2 x)$

$y' = 2\cos 2x$

#15

$y = \frac{1}{\sin x + \cos x}$

$y' = \frac{(\sin x + \cos x)0 - 1(\cos x - \sin x)}{(\sin x + \cos x)^2}$

$y' = \frac{\sin x - \cos x}{(\sin x + \cos x)^2}$

4. Determine values of x for which a function is differentiable. Ch Rev #31 - 34

denominator $\neq 0$

(34) $y = (2x-7)^{-1}(x+5)$

$y = \frac{x+5}{2x-7}$ $x \neq \frac{7}{2}$

5. Find dy/dx and $d^2y/dx^2$ for a polynomial function.

$y''$ second derivative

$y = 3x^4 - 12x^3$

$y' = 12x^3 - 36x^2$

$y'' = 36x^2 - 72x$

6. Find the x and y coordinates where a curve has horizontal tangents. 3.3 #39 $y' = 0$

$y = 2x^3 - 3x^2 - 12x + 20$

$y' = 6x^2 - 6x - 12 = 0$

$6(x^2 - x - 2) = 0$

$6(x-2)(x+1) = 0$

$x = 2 \quad x = -1$ points

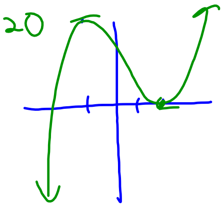
$y = 2x^3 - 3x^2 - 12x + 20$ for y-values

$y(2) = 2(2)^3 - 3(2^2) - 12(2) + 20$
$= 0$

$\boxed{(2, 0) \ (-1, 27)}$

$y(-1) = 2(-1)^3 - 3(-1)^2 - 12(-1) + 20$

$= -2 - 3 + 12 + 20$
$= 27$



8. Find derivatives using numerical values. Ch Rev #68

3.3 # 23

$u(\cancel{0})=5 \quad u'(\cancel{0})=-3 \quad v(\cancel{0})=-1 \quad v'(\cancel{0})=2$

$$\frac{d}{dx}\left(\frac{v}{u}\right) = \frac{u\cdot v' - v\cdot u'}{u^2} = \frac{(5)(2)-(-1)(-3)}{5^2}$$

$$= \frac{10-3}{25} = \frac{7}{25}$$

7. Use the product rule to find the derivative (polynomials)

$(3x^2+7)(2x-1)$

$y' = (3x^2+7)(2) + 6x(2x-1)$

$= 6x^2+14+12x^2-6x$

$= 18x^2-6x+14$

9. Find derivatives of functions with negative and rational exponents. Ch Rev #7, 3.3 # 32

#7

$$y = \sqrt{x} + 1 + \frac{1}{\sqrt{x}}$$

$$y = x^{\frac{1}{2}} + 1 + x^{-\frac{1}{2}}$$

$$y' = \frac{1}{2}x^{-\frac{1}{2}} - \frac{1}{2}x^{-\frac{3}{2}}$$

$$y' = \frac{1}{2\sqrt{x}} - \frac{1}{2x^{\frac{3}{2}}}$$

10. Analyze particle motion given position equation.

3.4 #19 a-e

$$s(t) = t^2 - 3t + 2$$

a) $(0,2)$ $\quad s(5) = 5^2 - 3(5) + 2$

$(5,12)$ $\quad =$

displacement $= 10$ m

b) average velocity $\frac{10\text{ m}}{5\text{ sec}} = 2$ m/sec

$(0,2)(5,12)$

$\frac{12-2}{5-0}$

c) instantaneous velocity

$S'(t) = 2t - 3$

at $t = 4$

$S'(4) = 2(4) - 3$

$= 5$ m/sec

d) acceleration

$S''(t) = 2\ \frac{\text{m}}{\text{sec}^2}$ always

e) particle change direction

$v(t) = 0$

$2t - 3 = 0$

$\boxed{t = \frac{3}{2} \text{ seconds}}$

11. Find the jerk function, given an equation for simple harmonic motion.

$y'''$

$y = 5\cos t$

$y' = -5\sin t$

$y'' = -5\cos t$

$\boxed{y''' = 5\sin t}$

13. Given the graph of a function, determine where it is differentiable.

12. Find the line tangent to the graph of a trigonometric function. Ch Rev #46, 47

$y = \sin x + \cos x$ at $x = \frac{\pi}{4}$

$y(\frac{\pi}{4}) = \sin\frac{\pi}{4} + \cos\frac{\pi}{4}$

$= \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} = \sqrt{2}$ $(\frac{\pi}{4}, \sqrt{2})$

$y' = \cos x - \sin x$

$y'(\frac{\pi}{4}) = \cos\frac{\pi}{4} - \sin\frac{\pi}{4}$

$= 0$

Point $(\frac{\pi}{4}, \sqrt{2})$ slope $= 0$

$\boxed{\text{Horizontal } y = \sqrt{2}}$

$y - \sqrt{2} = 0(x - \frac{\pi}{4})$

$y = \sqrt{2}$