Review Questions:

Practice Test...

#4) $s(\theta) = \sqrt{2}\cos\theta + \theta$, $0 \le \theta \le 2\pi$

$s'(\theta) = 0$ ← Hor. tan. line

$s'(\theta) = -\sqrt{2}\sin\theta + 1$

$0 = -\sqrt{2}\sin\theta + 1$

$\frac{-1}{-\sqrt{2}} = \sin\theta$

$\sin\theta = \frac{1}{\sqrt{2}}$

(Ref $\frac{\pi}{4}$, Q1,2)

$180-\theta$	θ
S	A
T	C
$180+\theta$	$360-\theta$

$\theta = \frac{\pi}{4}, \frac{4\pi}{4} - \frac{\pi}{4}$

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

$s\left(\frac{\pi}{4}\right) = \sqrt{2}\cos\frac{\pi}{4} + \frac{\pi}{4}$

$= \sqrt{2}\left(\frac{1}{\sqrt{2}}\right) + \frac{\pi}{4}$

$= 1 + \frac{\pi}{4}$

$\left(\frac{\pi}{4}, 1+\frac{\pi}{4}\right)$

$s\left(\frac{3\pi}{4}\right) = \sqrt{2}\cos\frac{3\pi}{4} + \frac{3\pi}{4}$

$= \sqrt{2}\left(\frac{-1}{\sqrt{2}}\right) + \frac{3\pi}{4}$

$= -1 + \frac{3\pi}{4}$

$\left(\frac{3\pi}{4}, -1+\frac{3\pi}{4}\right)$

1. a) $\sec(\cot x^3)$

$\sec(\cot x^3)\tan(\cot x^3)\left[-\csc^2 x^3 (3x^2)\right]$

2. b) $x^3+y^3=6xy$ @ $(3,3)$

$3x^2+3y^2\frac{dy}{dx}=6y\times 6x\frac{dy}{dx}$

$\frac{dy}{dx}=\frac{6y-3x^2}{3y^2-6x}$

at $(3,3)$ $m=?$

$m=\frac{6(3)-3(3)^2}{3(3)^2-6(3)}$

$m=-1$

$y-3=-1(x-3)$

$y-3=-x+3$

$y=-x+6$

or $x+y-6=0$

6. $s(t) = t^3 - 15t^2 + 72t - 5$

a) $s'(t) = 3t^2 - 30t + 72$

$s''(t) = 6t - 30$

$12 = 6t - 30$

$\frac{42}{6} = \frac{6t}{6}$

$7 = t$

7 sec = rim $\Longrightarrow$ $s'(7) = 3(7)^2 - 30(7) + 72$

$= 9$ m/s

b) velocity < 0

$\frac{3t^2}{3} - \frac{30}{3}t + \frac{72}{3} < \frac{0}{3}$

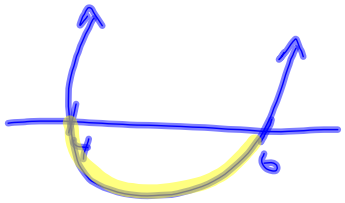
$t^2 - 10t + 24 < 0$

$(t-6)(t-4) < 0$

x-Intercepts

$t = 6, 4$

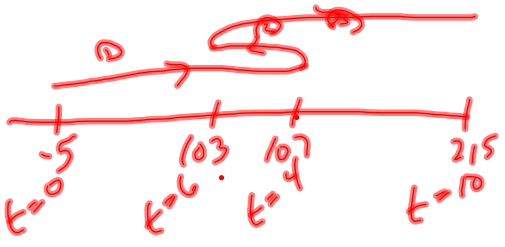
opens up



$\{4 < t < 6\}$

c)

time	Position
0	-5
4	107
6	103
10	215



distance = 112 + 4 + 112

= 228 m

7. $f(x) = x^2 + x$ · at $x = 5$ & $x = -1$

$f'(x) = 2x + 1$

at $x = 5$

$f'(5) = 2(5) + 1$

$m = 11$

$f(5) = (5)^2 + 5$

$= 30$

$(5, 30)$ $m = 11$

$y - 30 = 11(x - 5)$

$y - 30 = 11x - 55$

$y = 11x - 25$

at $x = -1$

$m = 2(-1) + 1$

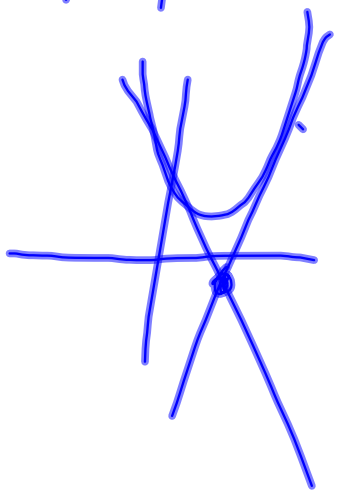
$= -1$

$f(-1) = (-1)^2 + (-1) = 0$

$(-1, 0)$ $m = -1$

$y - 0 = -1(x + 1)$

$y = -x - 1$



$11x - 25 = -x - 1$

$\frac{12x}{12} = \frac{24}{12}$

$x = 2 \Longrightarrow y = -2 - 1$

$y = -3$

$(2, -3)$

Pg. 126 $\boxed{s = 450 + 10t - 5t^2}$

#9 a) $s' = 0$

$s' = 10 - 10t$

$0 = 10 - 10t$

$10t = 10$

$t = 1 \text{ sec}$

b) $\frac{0}{5} = \frac{450}{5} + \frac{10t}{5} - \frac{5t^2}{5}$

$0 = 90 + 2t - t^2$

$t = \frac{-2 \pm \sqrt{4 - 4(-1)(90)}}{2(-1)}$

$t = 10.5 \text{ sec}$

(c)

Practice Test

#5 $f(x)=(x^2-2)(x-2)^{-1}$

$f'(x)=(2x)(x-2)^{-1}+(x^2-2)\left[-1(x-2)^{-2}(1)\right]$

Find $m=-1$

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

$(x-2)^2\left(\frac{2x}{x-2}-\frac{x^2-2}{(x-2)^2}=-1(x-2)^2\right)$

$(x-2)(2x)-x^2+2=-1(x-2)^2$

Pg. 111 $y'' = ??$

#7a) $x^4 + y^4 = 1$

$$4x^3 + 4y^3 \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = \frac{-4x^3}{4y^3}$$

$$\frac{dy}{dx} = -\frac{x^3}{y^3}$$

$$\frac{d^2y}{dx^2} = \frac{-3x^2y^3 + x^3\left(3y^2 \frac{dy}{dx}\right)}{y^6}$$

$$\frac{d^2y}{dx^2} = \frac{-3x^2y^3 + 3x^3y^2\left(-\frac{x^3}{y^3}\right)}{y^6}$$

Related Rates

Must understand the process of implicit differentiation...

Interpret the notation $\frac{dy}{dx}$

What about $\frac{dV}{dt}$, given that "V" is volume and "t" is time.

Example:

Given the formula $P = 2l + 2w$

- differentiate with respect to *w*
- differentiate with respect to P
- differentiate with respect to time *(use t)*

Differentiate each of the following with respect to time:

$A = \pi r^2$

$a^2 + b^2 = c^2$

$V = \frac{1}{3}\pi r^2 h$

Attachments

Integration Tables.pdf