Time to check your understanding...

$s'(t) = 6t^2 - 18t + 12$ (Velocity)

$s''(t) = 12t - 18$

(a) $2 = 12t - 18$

$\frac{20}{12} = \frac{12t}{12}$

$t = \frac{5}{3}$ sec

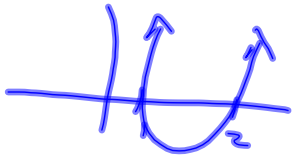
$s'\left(\frac{5}{3}\right) = 6\left(\frac{5}{3}\right)^2 - 18\left(\frac{5}{3}\right) + 12$

$= -\frac{4}{3}$ u/s

b) $\frac{6t^2}{6} - \frac{18t}{6} + \frac{12}{6} > \frac{0}{6}$

$t^2 - 3t + 2 > 0$

$(t-2)(t-1) > 0$

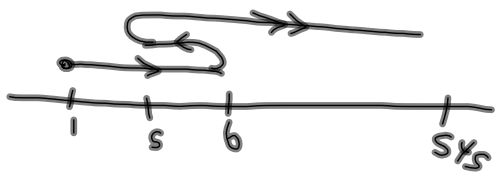


$0 \leq t < 1$ and $t > 2$

c)

t	s
start → 0	1
steps 1	6
2	5
final location → 8	54 5

$s(0), s(1), s(2), s(8)$



distance $= 5 + 1 + 540$

$= 546$ units

Revisit slope....

For $x^3 + y^3 = 6xy$, find the equation of the tangent line at (3,3)

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

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

at (3,3)

$m=\frac{6(3)-3(3)^2}{3(3)^2-6(3)}=-1$

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

$y-3=-x+3$

$\boxed{y=-x+6}$

Find all points where the tangent line to $y^3 - xy = -6$ is either horizontal or vertical.

$3y^2\frac{dy}{dx}-\left(y+x\frac{dy}{dx}\right)=0$

$m=0$ $\quad$ m is undefined

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

Horizontal: (Set Numerator $=0$) $\frac{dy}{dx}=0$

$y=0$

$y^3-xy=-6$

$0^3-x(0)=-6$

$\therefore$ LS $\neq$ RS

$\therefore$ None

Vertical (Let Denominator $=0$)

System $\begin{cases} 3y^2-x=0 \\ y^3-xy=-6 \end{cases}$

$x=3y^2$

$y^3-(3y^2)y=-6$

$y^3-3y^3=-6$

$-2y^3=-6$

$y^3=3$

$y=\sqrt[3]{3}$

$x=3y^2$

$x=3(\sqrt[3]{3})^2$

$x=3\sqrt[3]{9}$

$(3\sqrt[3]{9},\sqrt[3]{3})$

$\left(\sqrt[m]{x}\right)^n=\sqrt[m]{x^n}$

Practice exercises...

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#3, 4, 5, 8, 9

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#6, 7, 8

Midterm Date: November 21

Next Test: Tuesday, November 6

Topics to Review:

- Power rule, product rule, quotient rule, chain rule
- Derivatives of trigonometric functions
- Applications of derivatives...
  *slopes of tangent lines
  *rectilinear motion
- Implicit differentiation
- Higher order derivatives

Review Questions...

Page 112 - 114
#1 c, d
#7 b, d
#8 b, d
9 a, b, d, f
#11
#12

Bonus #13

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#1 (ii)
#3
#4
#5

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#2
#3