Today's Plan:

Learning Target (standard): I will solve real-world rates of change application problems. I will describe the motion of a particle.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make neccessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuarcy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

p.188 #1-15

$1)\, r'(8) = \frac{\sqrt[3]{2}}{8} \frac{cm}{\min}$

$2)\, V'(8) = 36\pi \frac{cm^3}{\min}$

$3)\, SA'(8) = 6\pi\sqrt[3]{4} \frac{cm^2}{\min}$

$4)\, V'(3) = -72\pi \frac{ft^3}{hr}$

$5)\, r'(3) = -2 \frac{ft}{hr}$

$6)\, SA'(3) = -48\pi \frac{ft^2}{hr}$

$7)\, P'(2) = 7 \frac{beats}{\sec}$

$8)\, P'(4) = 15 \frac{beats}{\sec}$

$9)\, P'(6) = 23 \frac{beats}{\sec}$

$10)\, T'(2) = \frac{11^\circ}{3} \frac{celsius}{\min}$

$11)\, T'(5) = \frac{47^\circ}{12} \frac{celsius}{\min}$

$12)\, T'(9) = \frac{397^\circ}{100} \frac{celsius}{\min}$

$13)\, A'(1) = 3200\pi \frac{cm^2}{\sec}$

$14)\, A'(2) = 6400\pi \frac{cm^2}{\sec}$

$15)\, A'(3) = 9600\pi \frac{cm^2}{\sec}$

The current *I* (in amperes) in a certain electrical circuit is given by $I = {}^{100}/_{R}$, where R denotes resistance (in ohms). Find the rate of change of *I* with respect to R when the resistance is 20 ohms.

$I = 100R^{-1}$

$I(R) = 100R^{-1}$

$I'(R) = -100R^{-2}$

$I'(R) = -\frac{100}{R^2}$

$I = 100R^{-1}$

$\frac{dI}{dR} = -100R^{-2}\frac{dR}{dR}$

$\rightarrow \frac{dI}{dR} = -\frac{100}{R^2}$

"derivative of I with respect to the derivative of R"

$I'(20) = -\frac{100}{20^2}$

$= -\frac{100}{400}$

$I'(20) = -\frac{1}{4}\ \frac{\text{amps}}{\text{ohm}}$

A cube's volume after *x* hours is given by
$v(x) = (2x^2 + x - 1)^3\ ft^3, 0 \le x \le 5.$

$V = lwh$

What is the rate of change of the following at *x* = 2:

1. volume
2. length
3. surface area

① $V'(x) = 3(2x^2+x-1)^2(4x+1)$

$V'(2) = 3(8+2-1)^2(8+1)$

$= 3(81)(9)$ $V'(x) = \frac{dV}{dx}$

$V'(2) = 2187\ ft^3/hr$

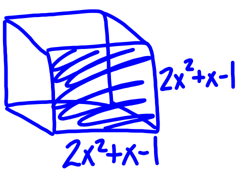
② $l(x) = 2x^2+x-1$

$l'(x) = 4x+1$ $l'(x) = \frac{dl}{dx}$

$l'(2) = 4(2)+1$

$l'(2) = 9\ ft/hr$

③ $SA(x) = 6(2x^2+x-1)^2$



$SA'(x) = 12(2x^2+x-1)(4x+1)$

$SA'(2) = 12(9)(9)$

$SA'(2) = 972\ ft^2/hr$

$SA'(x) = \frac{dSA}{dx}$

If the position of a particle is given by $s(t) = t^3 - 12t^2 + 36t + 18$, when $t > 0$, find the point at which the particle changes direction. When is the particle traveling in the positive direction? When is the particle traveling in the negative direction? Find the interval of time during which the particle is slowing down.

① $v(t) = s'(t)$

$v(t) = 3t^2 - 24t + 36$

$0 = 3(t^2 - 8t + 12)$

$0 = 3(t-6)(t-2)$

$t = 2, 6$

$a(t) = v'(t) = s''(t)$

$a(t) = 6t - 24$

$0 = 6(t-4)$

$t = 4$

∴ The particle changes direction when $v(t) = 0$ and $a(t) \neq 0$. This happens @ $t = 2$ & $t = 6$.

② positive direction

$v(t) > 0$

Domain Interval	3	t-6	t-2	v(t)
(0,2)	+	−	−	+
(2,6)	+	−	+	−
(6,∞)	+	+	+	+

∴ The particle moves in the positive direction when $v(t) > 0$. This happens $0 < t < 2$ and $t > 6$.

③ The particle moves in the negative direction when $v(t) < 0$. This happens when $2 < t < 6$.

④

	v(t)	a(t)	Speed
(0,2)	+	−	decreasing
(2,4)	−	−	increasing
(4,6)	−	+	decreasing
(6,∞)	+	+	increasing

∴ The particle is slowing down when velocity and acceleration have opposite signs. This happens @ $0 < t < 2$ and $4 < t < 6$

Assignment:

Worksheet p.117 #1-9