Today's Plan:

Learning Target (standard): I will review for the semester exam.

Students will: Complete practice problems over previous concepts at the boards and study for my exam.

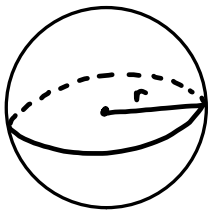
Teacher will: Provide practice problems over previous concepts, check homework problems for accuarcy and provide students feedback, describe and provide examples of exam problems.

Assessment: Board work

Differentiation: Students will work at the board, actively engage in practice review concepts with the aid of other students and the teacher.

Solve each related rate problem.

8) A spherical snowball is rolled in fresh snow, causing it to grow so that its radius increases at a rate of 3 in/sec. How fast is the volume of the snowball increasing when the radius is 7 in?



$\frac{dr}{dt} = 3 \text{ in/sec}$ $\frac{dV}{dt} = ?$

when $r = 7$ in

$V = \frac{4}{3}\pi r^3$

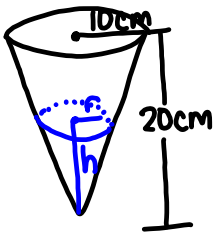
$\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$

$\frac{dV}{dt} = 4\pi(7)^2(3)$

$\frac{dV}{dt} = 4\pi(49)(3)$

$\frac{dV}{dt} = 588\pi \text{ in}^3/\text{sec}$

9) A conical paper cup is 20 cm tall with a radius of 10 cm. The cup is being filled with water so that the water level rises at a rate of 2 cm/sec. At what rate is water being poured into the cup when the water level is 9 cm?



$\frac{dh}{dt} = 2 \text{cm/sec}$

$\frac{dV}{dt} = ?$ when $h = 9$cm

$\frac{10}{20} = \frac{r}{h}$

$20r = 10h$

$r = \frac{1}{2}h$

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

$V = \frac{1}{3}\pi\left(\frac{1}{2}h\right)^2 h$

$V = \frac{1}{3}\pi\left(\frac{1}{4}h^2\right)h$

$V = \frac{1}{12}\pi h^3$

$\frac{dV}{dt} = \frac{1}{4}\pi h^2 \frac{dh}{dt}$

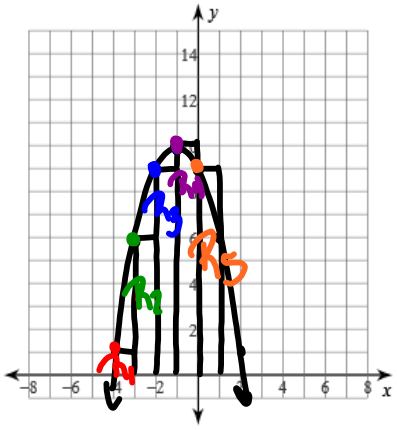
$\frac{dV}{dt} = \frac{1}{4}\pi(9)^2(2)$

$\frac{dV}{dt} = \frac{1}{2}\pi(81)$

$\frac{dV}{dt} = \frac{81\pi}{2} \text{ cm}^3/\text{sec}$

Approximate the area under the curve over the given interval using 5 left endpoint rectang

10) $y = -x^2 - 2x + 9;\ [-4, 1]$



vertex:

$x = \frac{-b}{2a} = \frac{2}{2(-1)} = \frac{2}{-2} = -1$

$(-1, 10)$

$\Delta x = \frac{b-a}{n} = \frac{1+4}{5} = 1$

$A_{R_1} = \Delta x \cdot f(-4)$

$= 1(1)$

$A_{R_1} = 1\ u^2$

$A_{R_2} = \Delta x \cdot f(-3)$

$= 1(6)$

$A_{R_2} = 6u^2$

$A_{R_3} = \Delta x \cdot f(-2)$

$= 1(9)$

$A_{R_3} = 9u^2$

$A_{R_4} = \Delta x \cdot f(-1)$

$= 1(10)$

$A_{R_4} = 10u^2$

$A_{R_5} = \Delta x \cdot f(0)$

$= 1(9)$

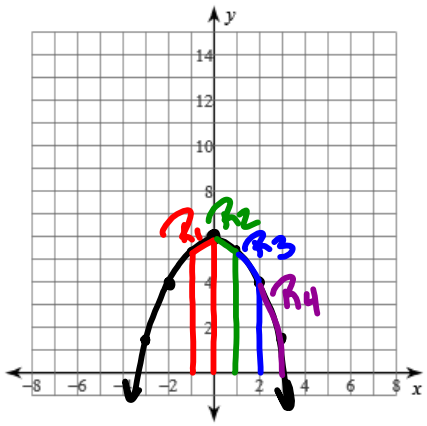
$A_{R_5} = 9u^2$

$A \approx 1+6+9+10+9$

$A \approx 35u^2$

Approximate the area under the curve over the given interval using 4 trapezoids.

11) $y = -\frac{x^2}{2} + 6;\ [-1, 3]$



$\Delta x = \frac{b-a}{n} = \frac{3+1}{4} = 1$

$A_{trapezoid} = \frac{1}{2}(b_1+b_2)h$

$A_{R_1} = \frac{1}{2}(f(-1)+f(0))\cdot 1$

$= \frac{1}{2}\left(\frac{11}{2}+6\right)$

$= \frac{1}{2}\left(\frac{23}{2}\right)$

$A_{R_1} = \frac{23}{4}u^2$

$A_{R_2} = \frac{1}{2}(f(0)+f(1))1$

$= \frac{1}{2}\left(6+\frac{11}{2}\right)$

$= \frac{1}{2}\left(\frac{23}{2}\right)$

$A_{R_2} = \frac{23}{4}u^2$

$A_{R_3} = \frac{1}{2}(f(1)+f(2))\cdot 1$

$= \frac{1}{2}\left(\frac{11}{2}+4\right)$

$= \frac{1}{2}\left(\frac{19}{2}\right)$

$A_{R_3} = \frac{19}{4}u^2$

$A_{R_4} = \frac{1}{2}(f(2)+f(3))\cdot 1$

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

$= \frac{1}{2}\left(\frac{11}{2}\right)$

$A_{R_4} = \frac{11}{4}u^2$

$A \approx \frac{23}{4}+\frac{23}{4}+\frac{19}{4}+\frac{11}{4}$

$A \approx \frac{76}{4}$

$A \approx 19u^2$

Evaluate each definite integral.

12) $\int_2^7 2(x-1)^{\frac{1}{3}}\,dx$

$u = x-1$

$du = dx$

$\Rightarrow 2\int_1^6 u^{\frac{1}{3}}\,du$

$= 2\left(\frac{3}{4}u^{\frac{4}{3}}\right)\Big|_1^6$

$= \frac{3}{2}\left(6^{\frac{4}{3}}-1^{\frac{4}{3}}\right)$

$= \frac{3}{2}\left(6\sqrt[3]{6}-1\right)$

$= \frac{18\sqrt[3]{6}-3}{2}$

13) $\int_0^1 (-x^5+3x^3)\,dx$

$= \left(-\frac{1}{6}x^6+\frac{3}{4}x^4\right)\Big|_0^1$

$= -\frac{1}{6}+\frac{3}{4}$

$= \frac{-2+9}{12}$

$= \frac{7}{12}$