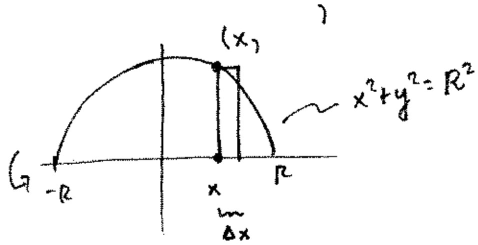
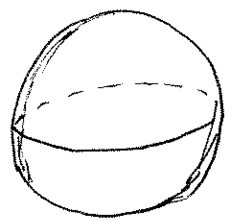
Math 1210-2
Tuesday Nov. 27

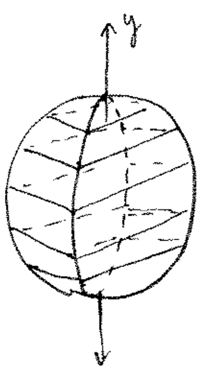
§5.2–5.3 : Volumes by planar slabs. (5.2)
by cylindrical shells (5.3)

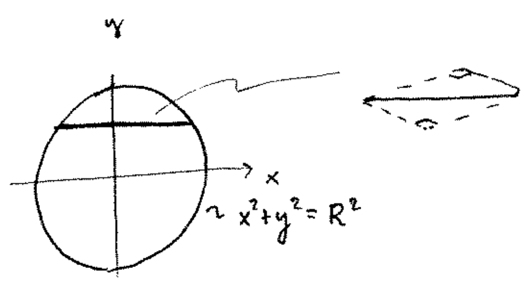
Exercise 1 : Derive the formula for a ball of radius R's volume, using disks. (This was Exercise 5 Monday.)



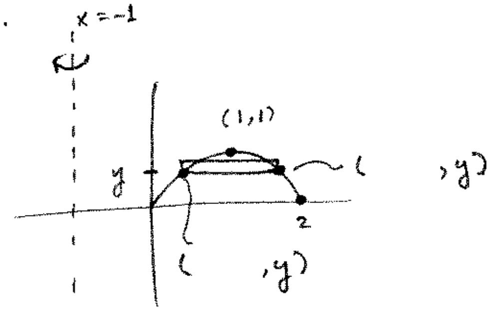


Exercise 2 A solid ball of radius R is "peeled" along perpendicular great circles creating an object with square cross-sections (⊥ to the axis through the pts of intersection of the great circles). Find the volume!





Exercise 3 The region bounded by the graph $y = -x^2 + 2x = -(x-1)^2 + 1$ and the x-axis is rotated about the line $x = -1$.

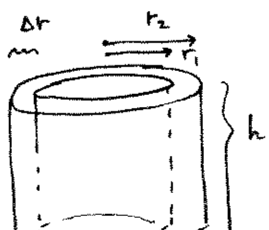


3a) Set up the integral for the volume of the resulting solid, using planar slabs (washers)

$\Delta V \approx$

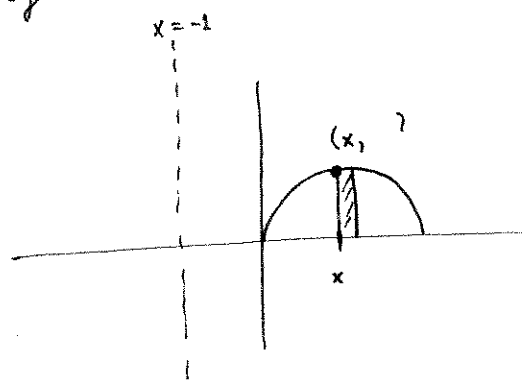
$V =$

3b) There's an easier way to do this problem, using cylindrical shells



$\Delta r = r_2 - r_1$

$\bar{r} = \frac{r_1 + r_2}{2}$ (average radius)



$V = \pi(r_2^2 - r_1^2)h$

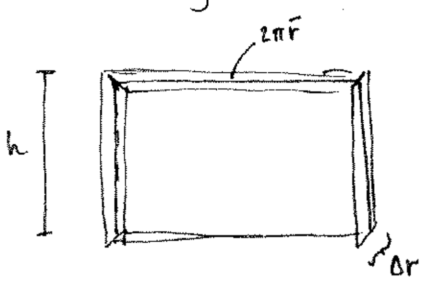
$= \pi(r_2 + r_1)h\underbrace{(r_2 - r_1)}_{\Delta r}$

$= 2\pi\bar{r}\,h\,\Delta r$

$\Delta V \approx$

$V =$

think of cutting & unrolling:



3a)

```
> Pi*Int((2+sqrt(1-y))^2-(2-sqrt(1-y))^2,y=0..1);
```

$$\pi \int_0^1 (2+\sqrt{1-y})^2 - (2-\sqrt{1-y})^2 \, dy$$

```
> Pi*int((2+sqrt(1-y))^2-(2-sqrt(1-y))^2,y=0..1);
```

$$\frac{16\,\pi}{3}$$

3b)

```
> 2*Pi*Int((-x^2+2*x)*(x+1),x=0..2);
```

$$2\,\pi \int_0^2 (-x^2+2\,x)(x+1)\,dx$$

```
> 2*Pi*int((-x^2+2*x)*(x+1),x=0..2);
```

$$\frac{16\,\pi}{3}$$

```
> evalf(%);
```

16.75516082

Exercise 4 Rework the volume of a radius R ball, using cylindrical shells