Calculus	Name: ______________________
Chap. 7 section 2	Date: ______________________
Targets with examples	Period: ______________________

Applications of Integrals

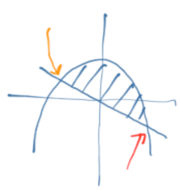
Integrals are powerful tools for solving problems.

7B Understanding Area Between Curves

1. Set up integrals that represent the area between curves
2. Use *dx* and *dy* integrals to find areas between curves

[7.2] 3, 7, 9, 15 - 25 odd, 35, 37

Set up integrals that represent the area between curves

<table>
<tr><td>Sample Question</td><td>Find the area of the region enclosed by the parabola y = 2 – x² and the line y = - x</td></tr>
<tr><td>Sample Response</td><td>Show / Hide Answer
Find the area of the region enclosed by the parabola y = 2 – x² and the line y = - x

TOP CURVE − BOTTOM CURVE
LIMITS
$-x = 2 - x^2$
$x^2 - x - 2 = 0$
$(x+1)(x-2) = 0$
$x = -1 \quad x = 2$
$\int_{-1}^{2} [2 - x^2 - (-x)]\,dx = \left[2x - \frac{x^3}{3} + \frac{x^2}{2}\right]_{-1}^{2}$
$= \boxed{\frac{9}{2} \text{ UNITS}^2}$</td></tr>
</table>

Use dx and dy integrals to find areas between curves

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<tr><td>Sample Question</td><td>Find the area of the region R in the first quadrant that is bounded above by $y=\sqrt{x}$ and below by the x-axis and the line $y=x-2$ by integrating with respect to y</td></tr>
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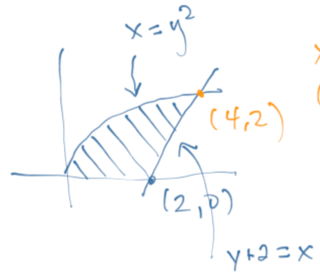

$x-2=\sqrt{x}$

$(x-2)^2 = x$

$x^2-4x+4-x=0$

$x^2-5x+4=0$

$(x-4)(x-1)$

RIGHT CURVE - LEFT CURVE

$$\int_0^2 \left[(y+2)-y^2\right] dy = \left[\frac{y^2}{2}+2y-\frac{y^3}{3}\right]_0^2$$

$$\boxed{= 10/3 \text{ units}^2}$$

</td></tr>
</table>

Find area between polar curves*

Sample Question	Find the area of the region inside enclosed by the cardioid $r = 2(1+\cos\theta)$
Sample Response	Show / Hide Answer Find the area of the region inside enclosed by the cardioid $r = 2(1+\cos\theta)$ IT TAKE 2π RADIANS TO GRAPH THE CARDIOD... (SEE CALCULATOR) $\int_0^{2\pi} \frac{1}{2} r^2 d\theta = \int_0^{2\pi} \left(\frac{1}{2} \cdot 4(1+\cos\theta)^2\right) d\theta$ $= \int_0^{2\pi} 2(1+2\cos\theta+\cos^2(\theta))\, d\theta$ $= \int_0^{2\pi} \left(2+4\cos\theta+2\frac{1+\cos 2\theta}{2}\right) d\theta$ $= \int_0^{2\pi} (3+4\cos\theta+\cos 2\theta)\, d\theta$ $= \left[3\theta+4\sin\theta+\frac{\sin 2\theta}{2}\right]_0^{2\pi} = \boxed{6\pi}$