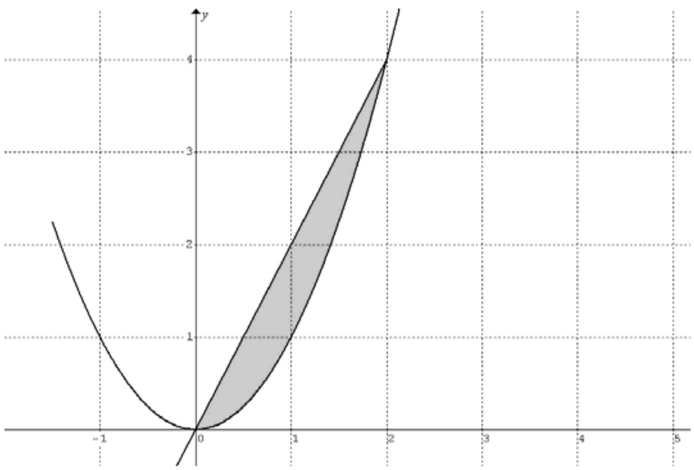
C3.Q104.NOTES: 15A DOUBLE INTEGRALS

LESSON 1 (15.1 – 15.3)

WARM UP: Find the area of the region *R* bounded by $y = x^2$ and $y = 2x$



1. Describe some possible meanings of the double integral: $\iint_R f(x,y)\,dA$

2. Express $\iint_R f(x,y)\,dA$ as $\iint_R f(x,y)\,dy\,dx$ and $\iint_R f(x,y)\,dx\,dy$

3. Evaluate $\iint_R f(x,y)\,dA$ for $f(x,y) = 1$

4. Evaluate $\iint_R f(x,y)dA$ for $f(x,y) = x^3 + 4y$

5. Express $\iint_R f(x,y)dA$ as $\iint_R f(x,y)dydx$ and $\iint_R f(x,y)dxdy$ for

R = Region bounded by: $x = y^3$, $x + y = 2$, $y = 0$

6. Express $\iint_R f(x,y)dA$ as $\iint_R f(x,y)dydx$ **OR** $\iint_R f(x,y)dxdy$

R = Region bounded by: $2y = 16 - x^2$, $x + 2y = 4$

7. Draw the region R in $\int_1^3 \int_{\pi/6}^{y^2} f(x,y)dxdy$. Evaluate $\int_1^3 \int_{\pi/6}^{y^2} f(x,y)dxdy$ for $f(x,y) = 2y\cos(x)$

8. Evaluate $\iint_R f(x,y)dA$ where R is the rectangular region $[1,4]\times[-1,2]$ and $f(x,y) = 2x + 6x^2 y$

LESSON 1 (15.1 – 15.3) HOMEWORK

Sketch the region bounded by the graphs of the given equations.

Express $\iint\limits_R f(x,y)dA$ as $\iint\limits_R f(x,y)dydx$ and $\iint\limits_R f(x,y)dxdy$

1. $y=\sqrt{x} \quad x=4 \quad y=0$

2. $y=\sqrt{x} \quad x=0 \quad y=2$

3. $y=\sqrt{x} \qquad y=x^3$

4. $8y=x^3 \quad y-x=4 \quad 4x+y=9$

5. Find the area bounded by $y=x \quad y=3x \quad x+y=4$

6. Find the volume of a lake whose surface is define by the region R in #5 and whose depth is defined by $f(x,y)=x+y$

7. Find the volume of the solid whose base is the region R bounded by $y^2=-x$, $x-y=4$, $y=-1$ and $y=2$ and whose height is $f(x,y)=xy$.

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LESSON 2 (15.1 – 15.3)

WORKSHOP: Section 15.3: #5, 7, 17, 21, 43, 45, 51, 55; Section 15.1 #1, 9; Section 15.2, #9,17

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LESSON 3 (15.4, 15.9)

1. (WARM UP) SET UP only the integral used to find the volume of the solid bounded by $z = 4 - x^2 - y^2$ and the *xy*-plane.

2. Find the volume of the solid described in #1 using a polar transformation.

3. Evaluate $\iint\limits_{R_{xy}} e^{-(x^2+y^2)} dxdy$ for the region *R* bounded in the first quadrant by the circles $x^2 + y^2 = 1$ $x^2 + y^2 = 4$.

4. Show that the transformation $T: x = r\cos\theta,\ y = r\sin\theta$ always yields $|J| = r$.

5. Evaluate $\iint_{R_{xy}} e^{(y-x)/(y+x)}dxdy$ where R is the region within the trapezoid defined by the points $(0,1)\,(0,2)\,(2,0)\,(1,0)$.