

TEST 1 PRACTICE PROBLEMS
CALCULUS II (MATH 152)
FALL 2013

(1) Evaluate

(a) $\int \theta \sec^2(3\theta^2) d\theta$

(b) $\int \frac{x^2}{\sqrt{x^3 + 4}} dx$

(c) $\int \frac{\cos(z)}{(1 + \sin(z))^3} dz$

(d) $\int \frac{\cos(z)}{1 + \sin(z)} dx$

(e) $\int_0^1 \frac{1}{9 + x^2} dx$

(2) Find the average value of each of the following functions over the specified interval:

(a) $f(x) = \sqrt{5x - 1}$ over $[1, 2]$.

(b) $g(x) = \cos(x)e^{\sin(x)}$ over $[2, 3]$.

(3) For each of the following problems, find the area bounded by the given curves/regions.

(a) $y = x^3 - 6x^2 + 8x$ and $y = 0$.

(b) $y = e^{2x}$, $y = -e^x$, $x = -2$ and $x = 5$.

(c) $x = y^2$, $x = 2$.

(d) $x = y^2$, $x = 2$, $y \geq 0$.

(e) $x = y^2$, $x = 2$, $y \geq -1$.

(f) $x = y^2 + 1$ and $x = -y^2 + 3$.

(4) For each of the following problems **set up, but do not evaluate the integral** for the volume of the solid generated by rotating the region bounded by the given curves/regions about the specified axis of rotation using the **Washer/Disk Method**.

(a) Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: x -axis.

(b) Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: $y = -2$.

(c) Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: $y = 1$.

(d) Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: $y = 3$.

(e) Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: $y = 5$.

(f) Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: y -axis.

(g) Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: $x = -5$.

(h) Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: $x = 5$.

- (5) For each of the following problems **set up, but do not evaluate the integral** for the volume of the solid generated by rotating the region bounded by the given curves/regions about the specified axis of rotation using the **(Cylindrical) Shell Method**.
- Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: x -axis.
 - Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: $y = -2$.
 - Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: $y = 1$.
 - Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: $y = 3$.
 - Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: $y = 5$.
 - Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: y -axis.
 - Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: $x = -5$.
 - Region: $y = x^2 + 1$, $y = 3$, $x \geq 0$; Axis of Rotation: $x = 5$.
- (6) For each of the following problems find the volume of the solid generated by rotating the region bounded by the given curves/regions about the specified axis of rotation using **any method**.
- Region: $y = 4 - 3x$, $y = 3$, $y = 0$, $x = 0$; Axis of Rotation: y -axis.
 - Region: $y = 4 - 3x$, $y = 3$, $y = 0$, $x = 0$; Axis of Rotation: x -axis.
 - Region: $y = \sqrt{2 - x}$, $x = -2$, $y = 0$; Axis of Rotation: $y = -3$.
 - Region: $y = 1/x^2$, $y = 2$, $x = 2$; Axis of Rotation: x -axis.
 - Region: $y = 1/x^2$, $y = 2$, $x = 2$; Axis of Rotation: y -axis.
 - Region: $y = 1/x^2$, $y = 2$, $x = 2$; Axis of Rotation: $x = -5$.
- (7) Find the length of the given curve over the specified interval.
- $y = 2x^{3/2} + 1$ from $x = 0$ to $x = 1$.
 - $x = \frac{1}{3}(y^2 + 2)^{3/2}$ from $y = 0$ to $y = 1$.
 - $y^2 = x^3$ from $x = 2$ to $x = 7$.
- (8) Find the area of the surface generated by revolving of the given curve about the x -axis.
- $y = 5x$ from $x = 0$ to $x = 1$.
 - $y = \sqrt{9 - x^2}$ from $x = 0$ to $x = 1$.
- (9) A force of 10 N is required to hold a spring that has been stretched from its natural length of 0.2 m to a length of 0.3 m. How much work is done in stretching the spring from 0.3 m to 0.4 m?
- (10) It takes 1 J of work to stretch a spring from its natural length to 10 m beyond its natural length. What is the force that is required to hold the stretched spring a distance of 20 m beyond its natural length?