Name_____

1) We want to calculate the following integral using integration by parts. Then the most appropriate choice on f and g' is

$$\int x^3 \sqrt{9 - x^2} \, dx$$

A) $f = x^2$, $g' = x^3 \sqrt{9 - x^2}$

B) $f = x^3$, $g' = \sqrt{9 - x^2}$

C) $f = 1$, $g' = x^3 \sqrt{9 - x^2}$

D) $f = x$, $g' = x^2 \sqrt{9 - x^2}$

E) $f = x^2$, $g' = x \sqrt{9 - x^2}$

1) _____

2) Calculate $\int x^4 \ln x \, dx$

A) $\dfrac{x^5}{5} - \dfrac{1}{25} x^5 + C$

B) $\dfrac{x^5}{5} \ln x - \dfrac{1}{25} + C$

C) $\dfrac{x^5}{5} \ln x - \dfrac{1}{25} x^5 + C$

D) $\dfrac{x^5}{5} \ln x - x^5 + C$

E) $6x^5 \ln x - \dfrac{1}{25} x^5 + C$

2) _____

3) How many times integration by parts formula is needed to calculate

$$\int x^9 e^x \, dx:$$

A) 7   B) 9   C) 6   D) 5   E) 1

3) _____

4) Calculate: $\int \sin^2 x \; dx$

4) _____

A) $\left[x - \dfrac{1}{2} \cos 2x \right] + C$

B) $\dfrac{1}{2} \left[1 - \dfrac{1}{2} \sin 2x \right] + C$

C) $\dfrac{1}{2} \left[x - \dfrac{1}{2} \sin 2x \right] + C$

D) $\dfrac{1}{2} \left[x - \cos 2x \right] + C$

E) $\dfrac{1}{2} \left[x - \dfrac{1}{2} \cos 2x \right] + C$

5) Which strategy is the best in evaluating $\int \tan^8 x \sec^8 x \; dx$?

5) _____

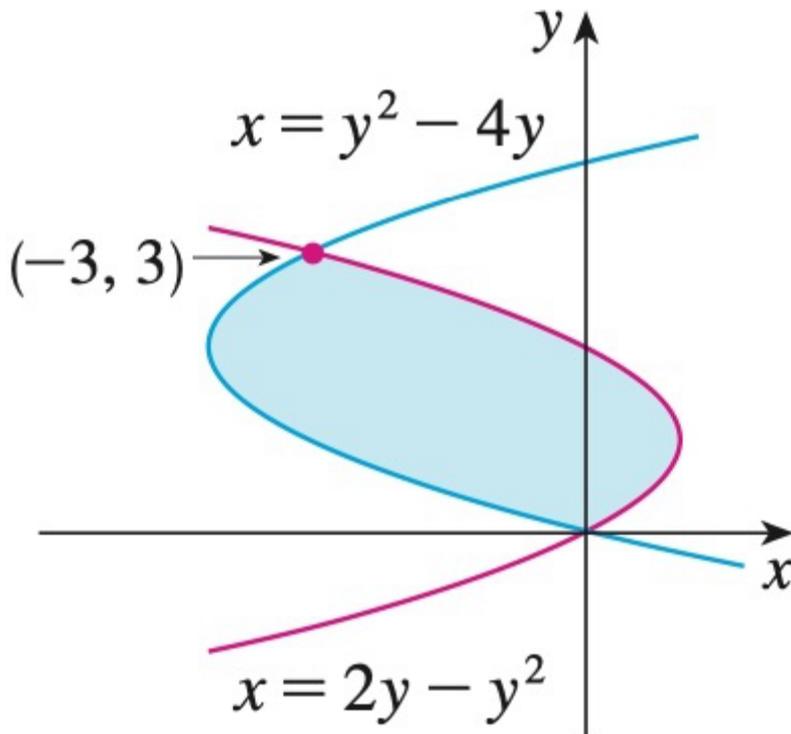A) integration by parts where $f = \tan x$ and $g' = \sec x$

B) save a factor $\sec x \tan x$, use $\tan^2(x) = \sec^2(x) - 1$ and let $u = \sec x$

C) integration by parts where $f = \sec x$ and $g' = \tan x$

D) substitution $u = \tan^8 x$

E) save a factor $\sec^2 x$, use $\sec^2(x) = 1 + \tan^2(x)$ and let $u = \tan x$

6) Set up the integral (in most simplified form) to find **the area** of the region bounded by $x = y^2 - 4y$, $x = 2y - y^2$, and the y - axis.

6) _____

$x = y^2 - 4y$

$(-3, 3) \longrightarrow$

$x = 2y - y^2$

A) $2 \displaystyle\int_0^3 \left(3y - y^2\right) dy$

B) $2 \displaystyle\int_0^3 \left(2y - y^3\right) dy$

C) $\displaystyle\int_0^3 \left(3 - y^2\right) dy \; + \int_{-3}^0 \left(y^2 - 3\right) dy$

D) $2 \displaystyle\int_0^3 \left(y - 3y^2\right) dy$

E) $\displaystyle\int_0^3 \left(y - y^2\right) dy \; + \int_{-3}^0 \left(3y^2 - 2y\right) dy$

3

7) Set up the integral to find **the area** of the region bounded by $y = \dfrac{1}{x}$,
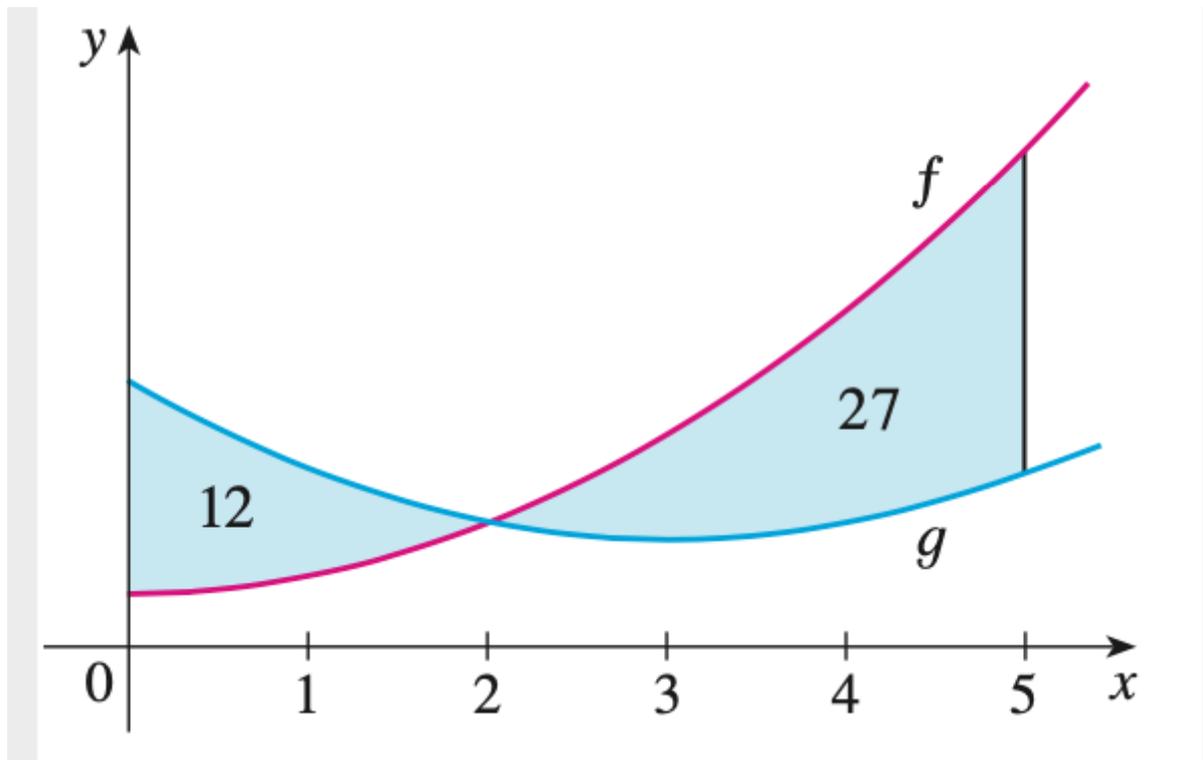
7) _____

$y = x$, $y = \dfrac{x}{4}$, $x > 0$
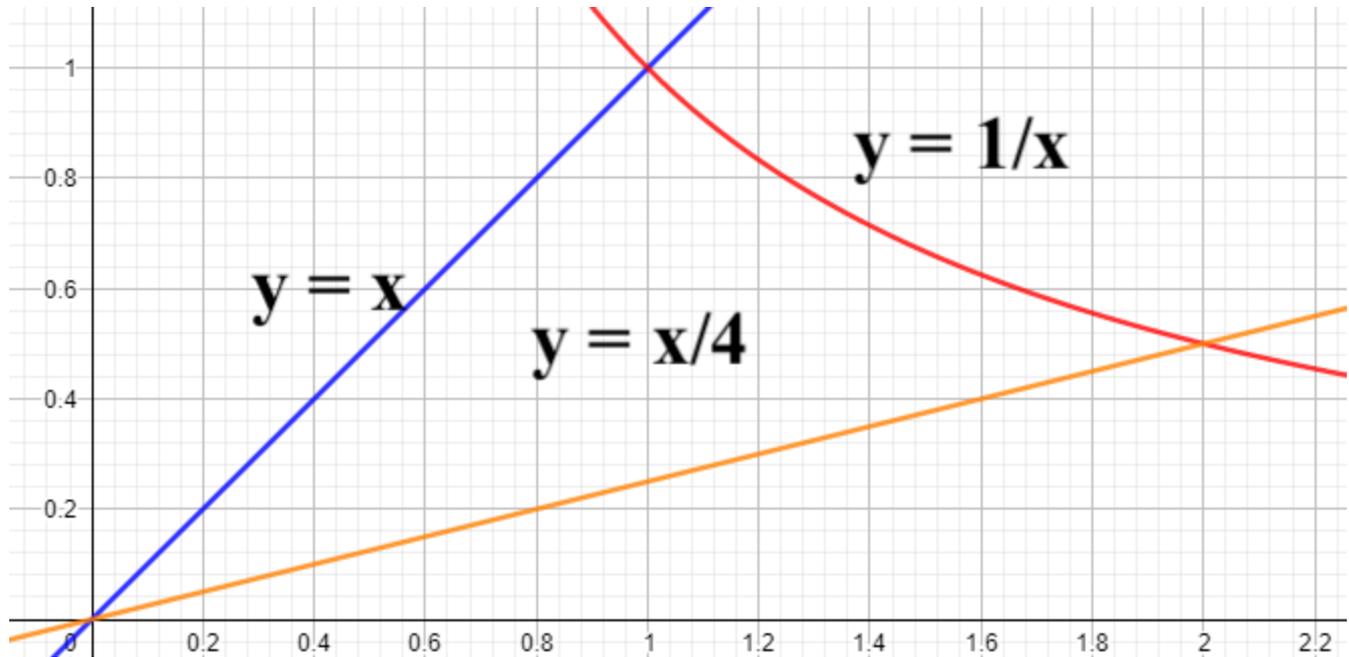
A) $\displaystyle\int_0^1 x\left(\frac{1}{x} - \frac{x}{4}\right)dx \;+\; \int_1^2 (2-x)\left(x - \frac{x}{4}\right)dx$

B) $\displaystyle\int_0^1 \left(x - \frac{x}{4}\right)dx \;+\; \int_1^2 \left(\frac{1}{x} - \frac{x}{4}\right)dx$

C) $\displaystyle\int_0^1 (1-x)\left(x - \frac{x}{4}\right)dx \;+\; \int_1^2 \left(x - \frac{1}{2}\right)\left(\frac{1}{x} - \frac{x}{4}\right)dx$

D) $\displaystyle\int_0^1 \left(x - \frac{x}{4}\right)dx$

E) $\displaystyle\int_1^2 \left(\frac{1}{x} - \frac{x}{4}\right)dx$

4

8) The graphs of two functions are shown with the areas of the regions between the curves indicated. Then calculate $\int_0^5 (f - g)\, dx$. 8) _____
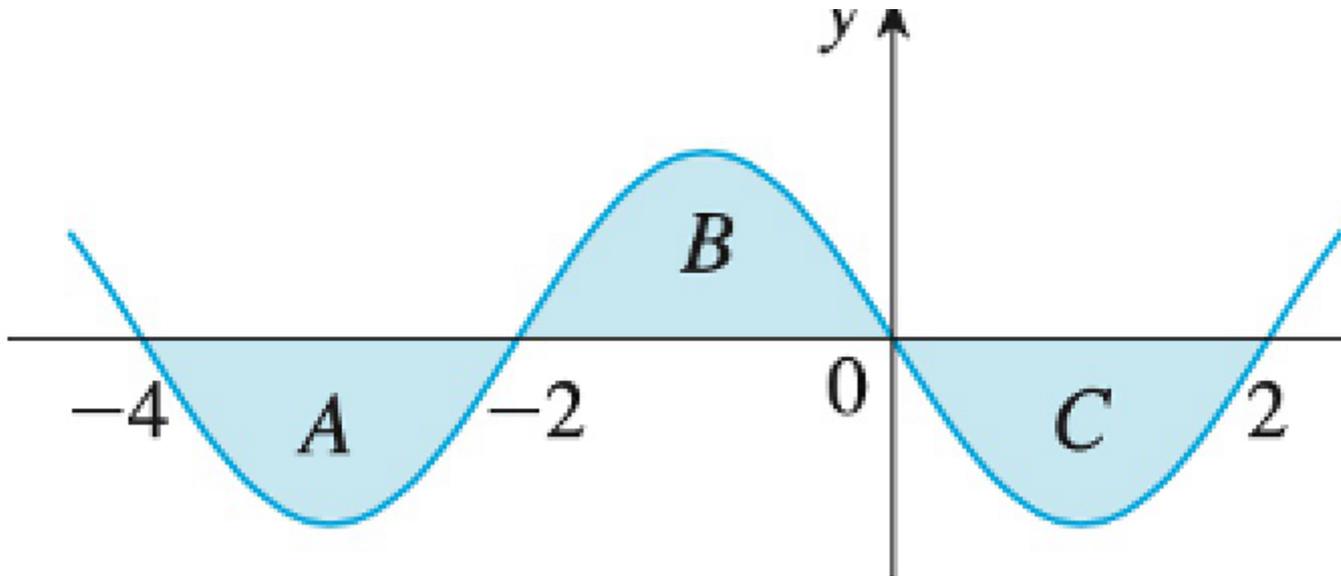

A) 27   B) - 39   C) 12   D) 15   E) 39

9) Calculate $\int_0^5 f(x)\, dx$ if $f(x)$ is $\quad f(x) = \begin{cases} 1\,,\, x < 3 \\ 2,\, x \geq 3 \end{cases}$. 9) _____

A) 5   B) 6   C) 8   D) 7   E) 9

10) Each of the regions A, B, C bounded by the graph of f and the x axis
has area 5. Then calculate $\int_{-4}^{2} f(x)\, dx$
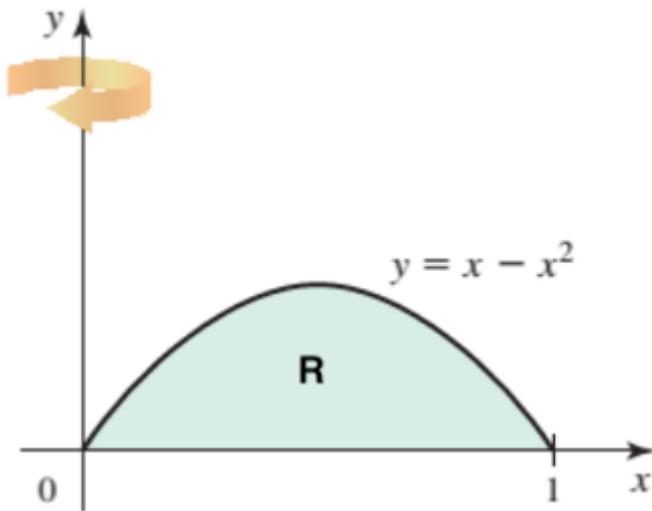
A) 0   B) 5   C) -15   D) 10   E) 1907

11) Let $f(x) = \int_{0}^{\sqrt{x}} \dfrac{t}{t^2 + 3}$. Then the first derivative of $f(x)$ is

A) $\dfrac{x}{x^2 + 3}$

B) $\dfrac{1}{x + 3}$

C) $\dfrac{1}{7}\,\dfrac{1}{x + 3}$

D) 7

E) $\dfrac{1}{2}\,\dfrac{1}{x + 3}$

12) Set up the integral (in simplified form) to calculate the volume of
the solid formed by revolving the region R **about the y - axis using
the shell method**

The graph and the options are on the next page

6

$$y = x - x^2$$

R

0 1 x

A) $2\pi \int_0^1 x\left(x^2 - x^3\right) dx$

B) $7 \int_0^1 \left(x^2 - x^3\right) dx$

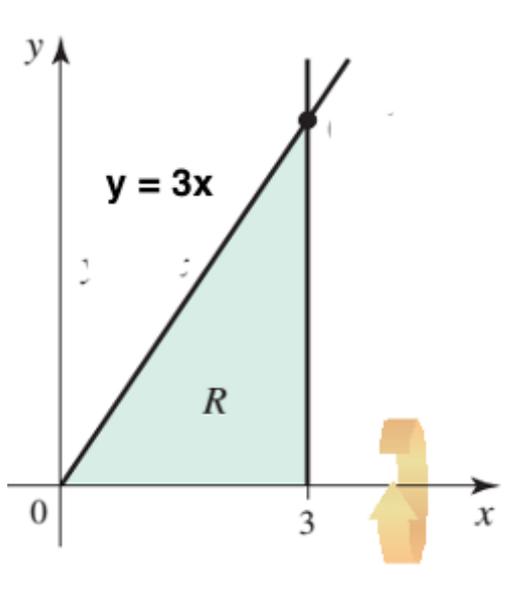C) $10\pi \int_0^1 \left(x^2 - x^3\right) dx$

D) $2\pi \int_0^1 \left(x^2 - x^3\right) dx$

E) $2\pi \int_0^1 (1 - x)\left(x - x^2\right) dx$

13) Set up the integral (in simplified form) to calculate the volume of the solid formed by revolving the region R **about the x - axis using the disk method**

13) _____

The graph and the options are on the next page

y = 3x

R

0

3

x

A) $9\pi \int_0^3 x^9 \ dx$

B) $9\pi \int_0^3 3x \ dx$

C) $9\pi \int_0^3 x^2 \ dx$
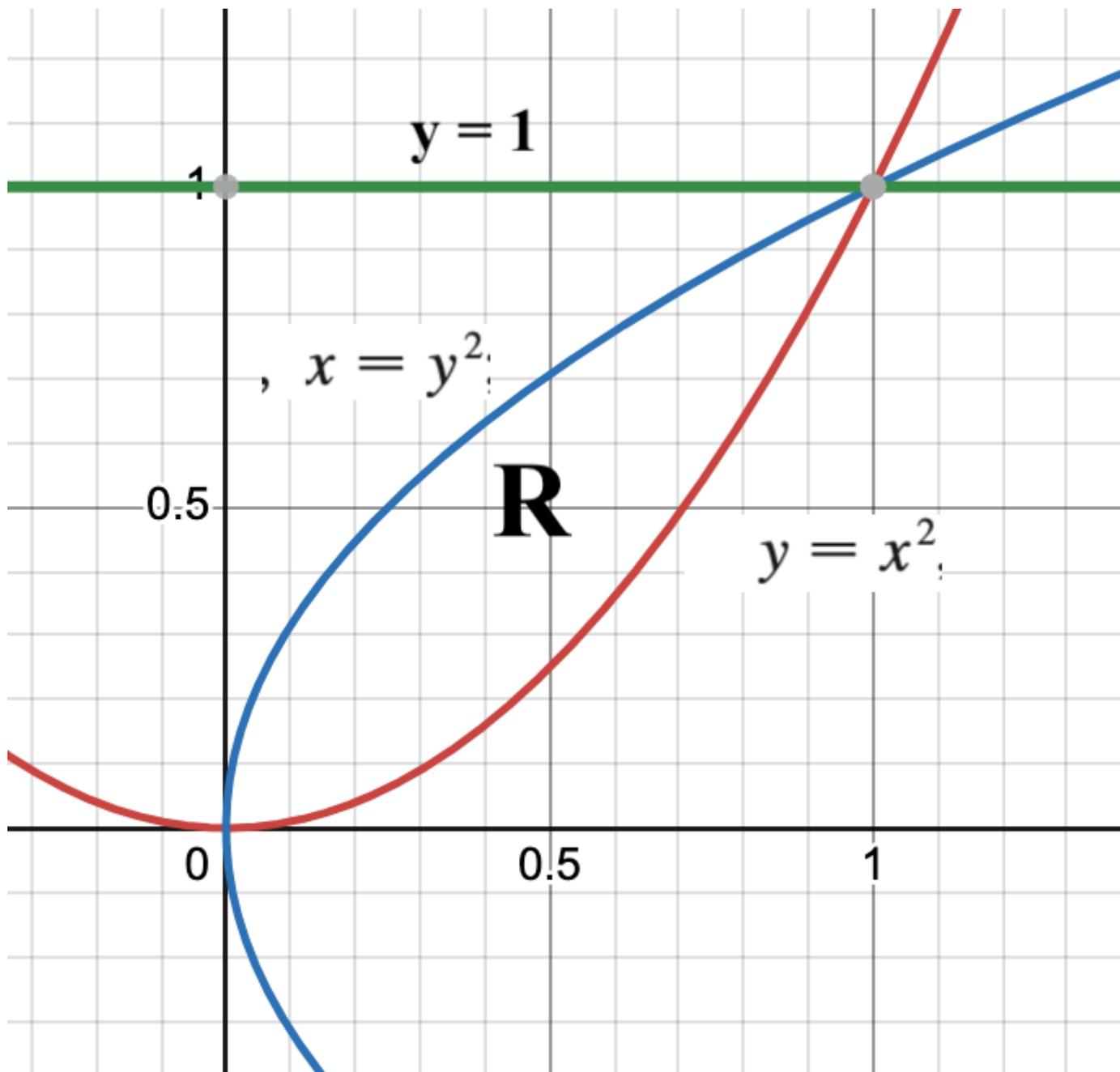
D) $\int_0^3 x^2 \ dx$

E) $9\pi \int_0^3 \left(3 - x^2\right) \ dx$

14) Set up the integral to calculate the volume of the solid formed by   14) _____
revolving the region R bounded by $y = x^2$ and $x = y^2$ **about y = 1**
using the shell method

The graph and the options are on the next page

$y = 1$

$x = y^2$

R

$y = x^2$

0.5

0

0.5

1

A) $2\pi \int_0^1 (1 - y)\left(\sqrt{y} - y^2\right)\ dy$

B) $4\pi \int_0^1 y\left(\sqrt{y} - y^2\right)\ dy$

C) $2\pi \int_0^1 (y - 1)\left(\sqrt{y} - y^2 - 1\right)\ dy$

Options D and E are on the next page

D) $2\pi \displaystyle\int_0^1 \left(\dfrac{1}{2} - y\right)\left(y^2 - \sqrt{y}\right)\, dy$

E) $\pi \displaystyle\int_0^1 \left(\sqrt{y} - y^2\right)\, dy$

15) Use **the disk method** to calculate the **volume** of the solid formed by revolving the region bounded by $y = -x + 1$ and the x - axis and the y - axis **about the x - axis.**, $0 \le x \le 1$.

15) _____

A) $\dfrac{\pi}{2}$ B) $\dfrac{\pi}{3}$ C) π D) $\dfrac{3}{\pi}$ E) $\dfrac{2}{\pi}$