

Let R be the region bounded by the graphs of $y = \sin(\pi x)$ and $y = x^3 - 4x$, in the domain $[0, 2]$.

a) Find the area of R .

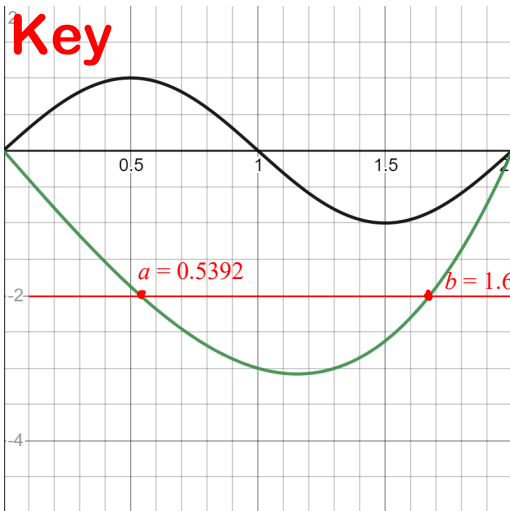
b) The horizontal line $y = -2$ splits the region R into two parts. What is the area of the region below this line?

First - work part (a) as a sum or difference of integrals.

Next - work the same problem as one integral.

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a)
$$\int_0^2 (y_1 - y_2) dx = \int_0^2 (\sin \pi x - x^3 + 4x) dx = 4$$

b)
$$a = 0.5392 \quad b = 1.6751$$

$$\int_a^b (-2 - x^3 + 4x) dx \approx 0.811$$

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Apr 16-8:14 AM

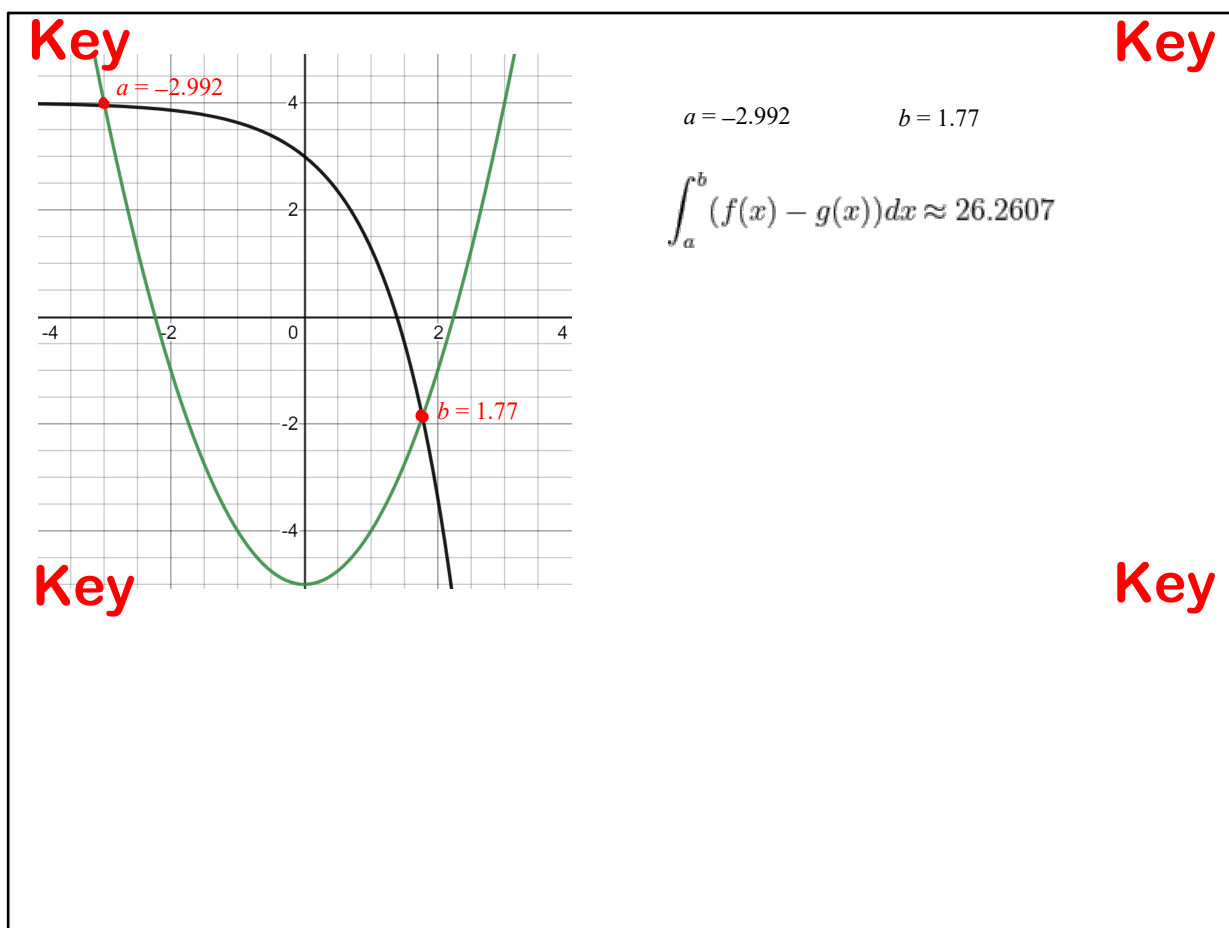
8-3 Maxima/Minima in Plane/Solid Figures

Find the area of the region bounded by:

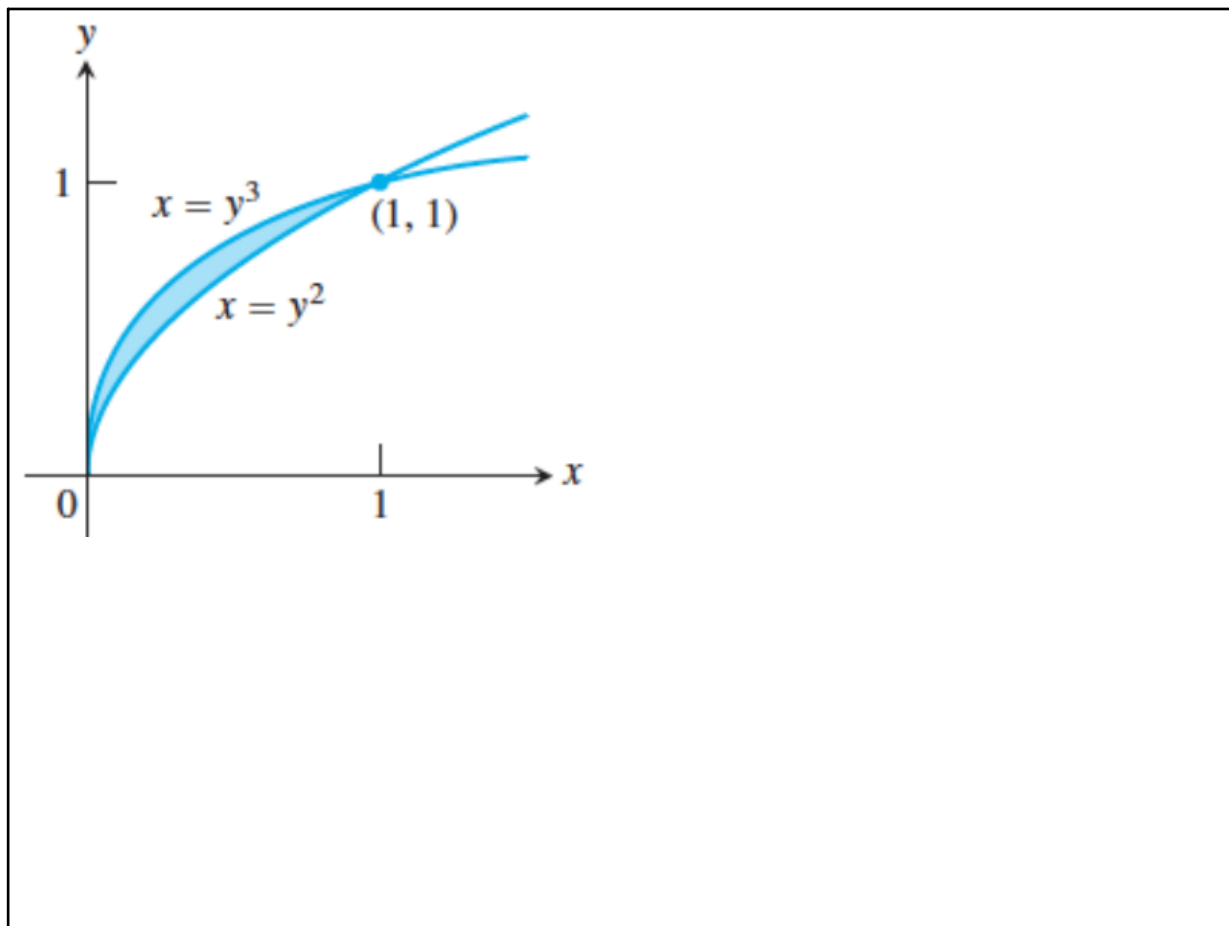
$$f(x) = 4 - e^x$$

$$g(x) = x^2 - 5$$

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May 19-2:42 PM

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$\int_0^1 (y^2 - y^3) dy \approx 0.0833$

$\int_0^1 (\sqrt[3]{x} - \sqrt{x}) dx \approx 0.0833$

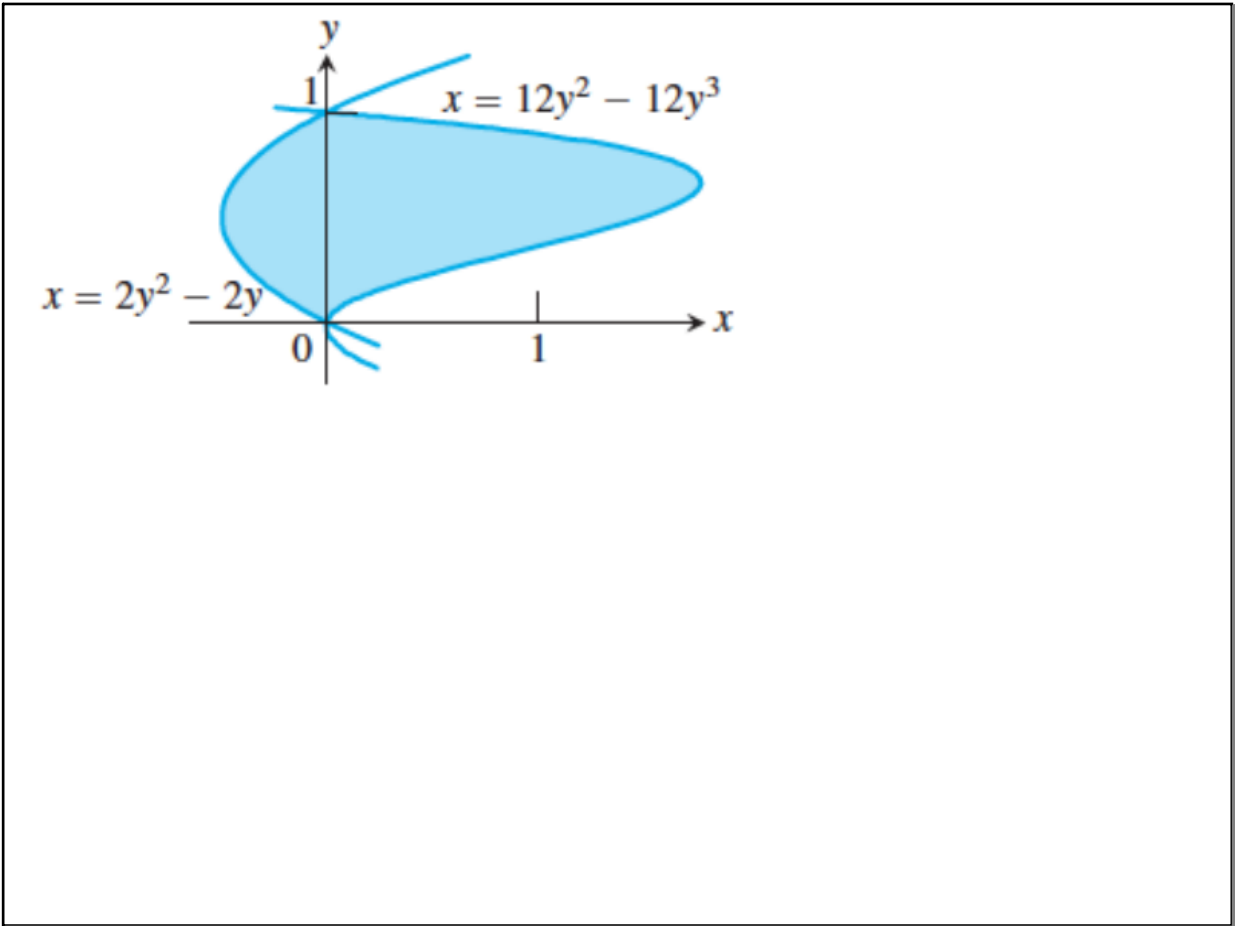
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A Cartesian coordinate system with x and y axes. The y-axis has a tick mark at 1, and the x-axis has a tick mark at 1. Two curves originate from the origin (0,0) and intersect at the point (1,1). The upper curve is labeled $x = y^3$ and the lower curve is labeled $x = y^2$. The region between these two curves from $y = 0$ to $y = 1$ is shaded in light blue.

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$x = 12y^2 - 12y^3$

$x = 2y^2 - 2y$

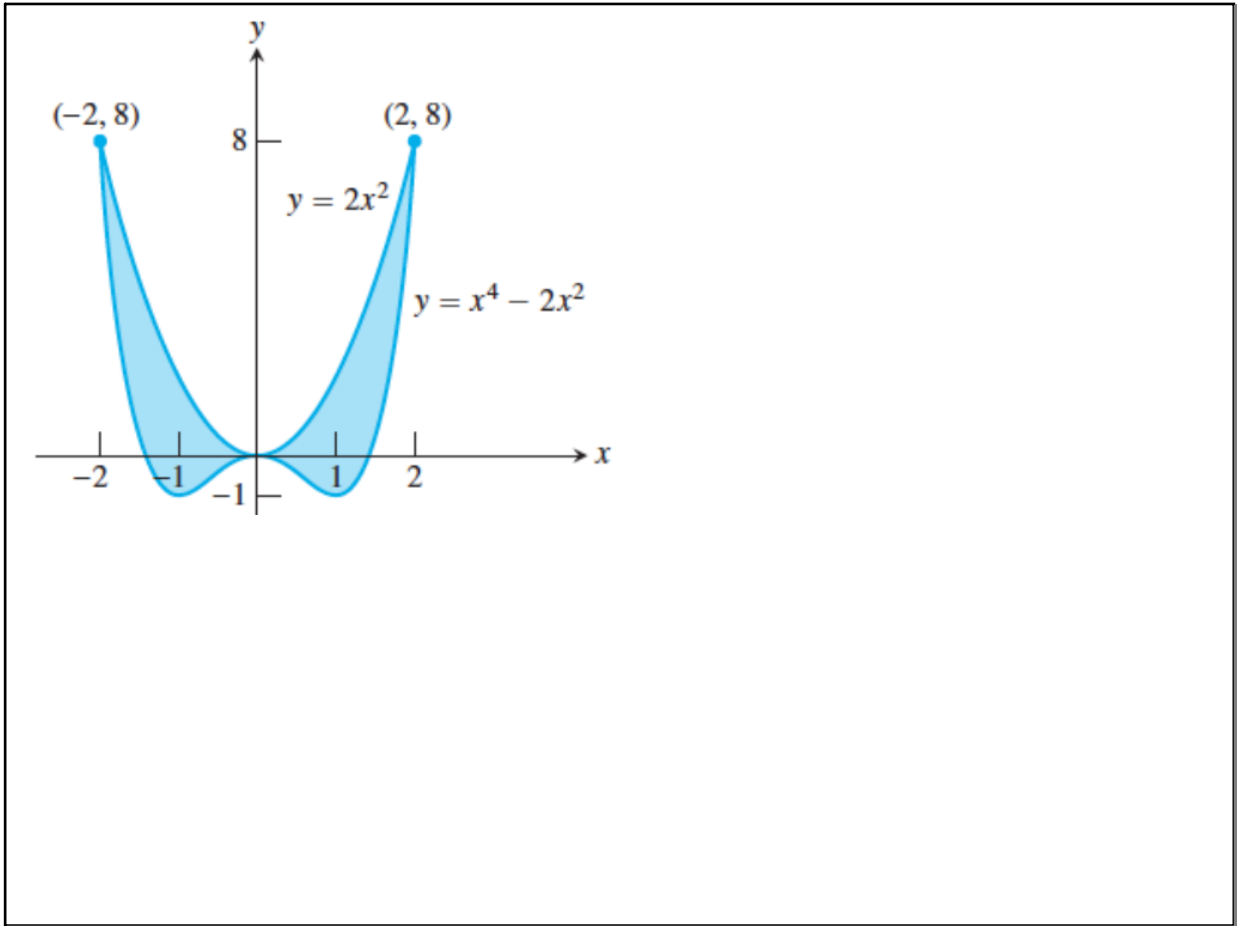
$\int_0^1 (12y^2 - 12y^3 - 2y^2 + 2y) dy \approx 1.333$

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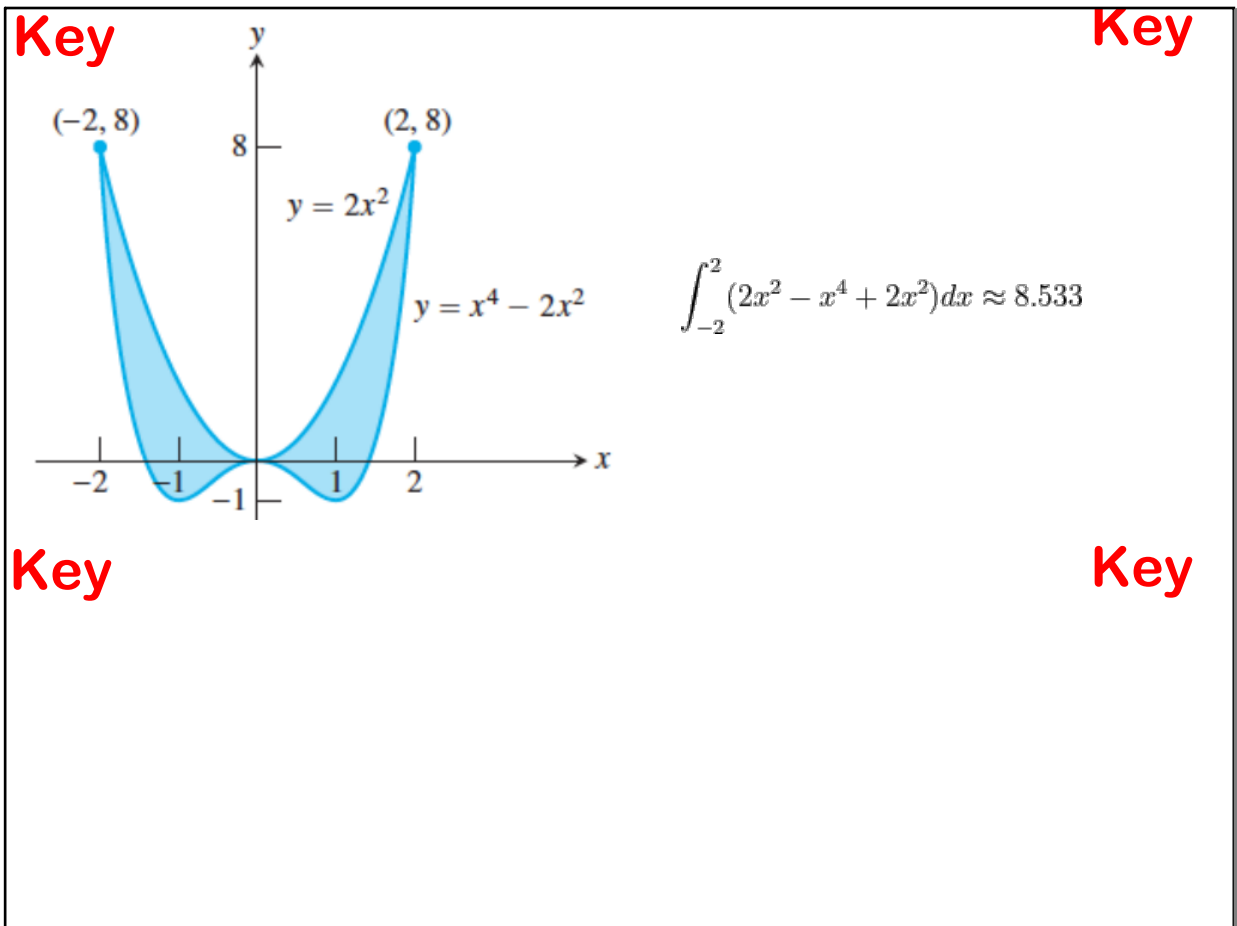
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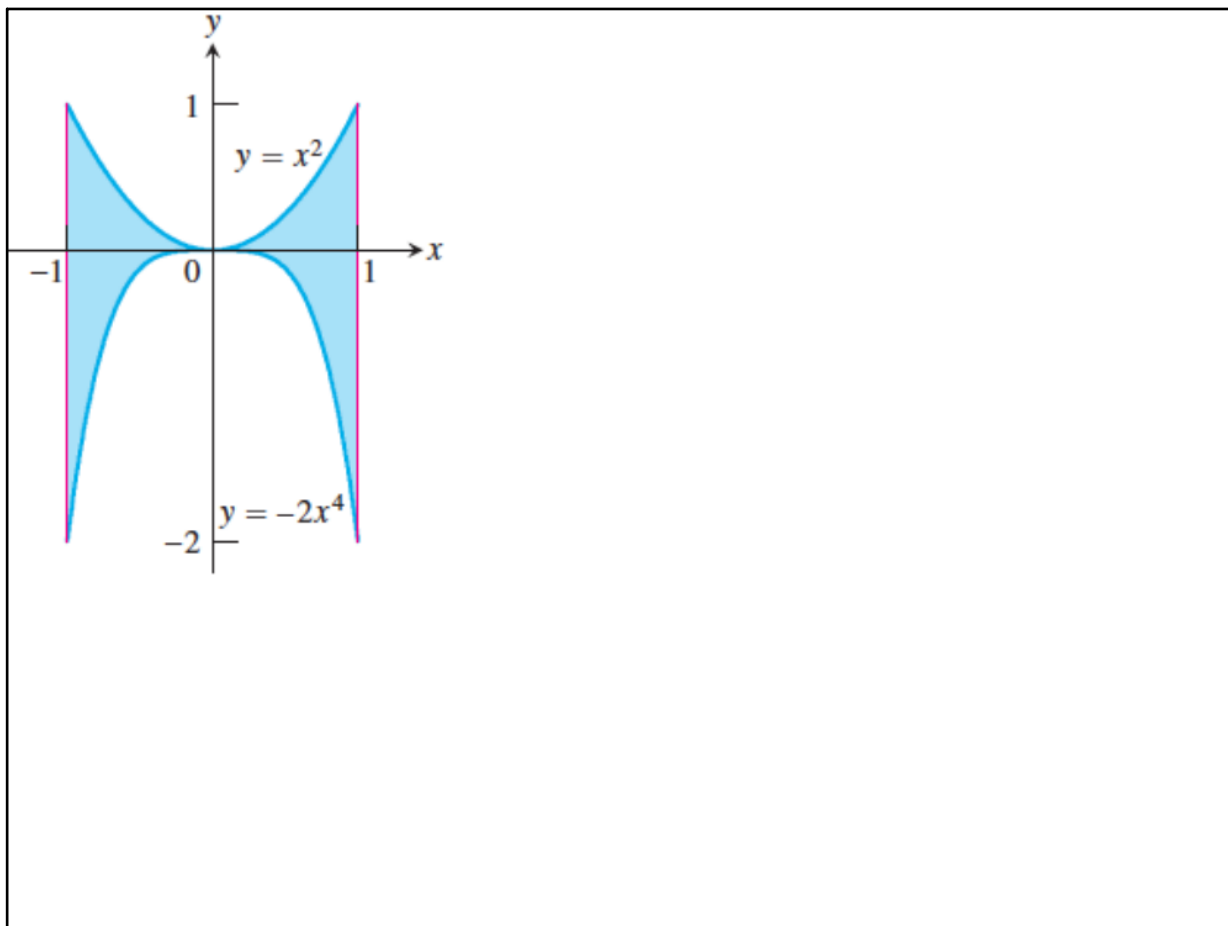
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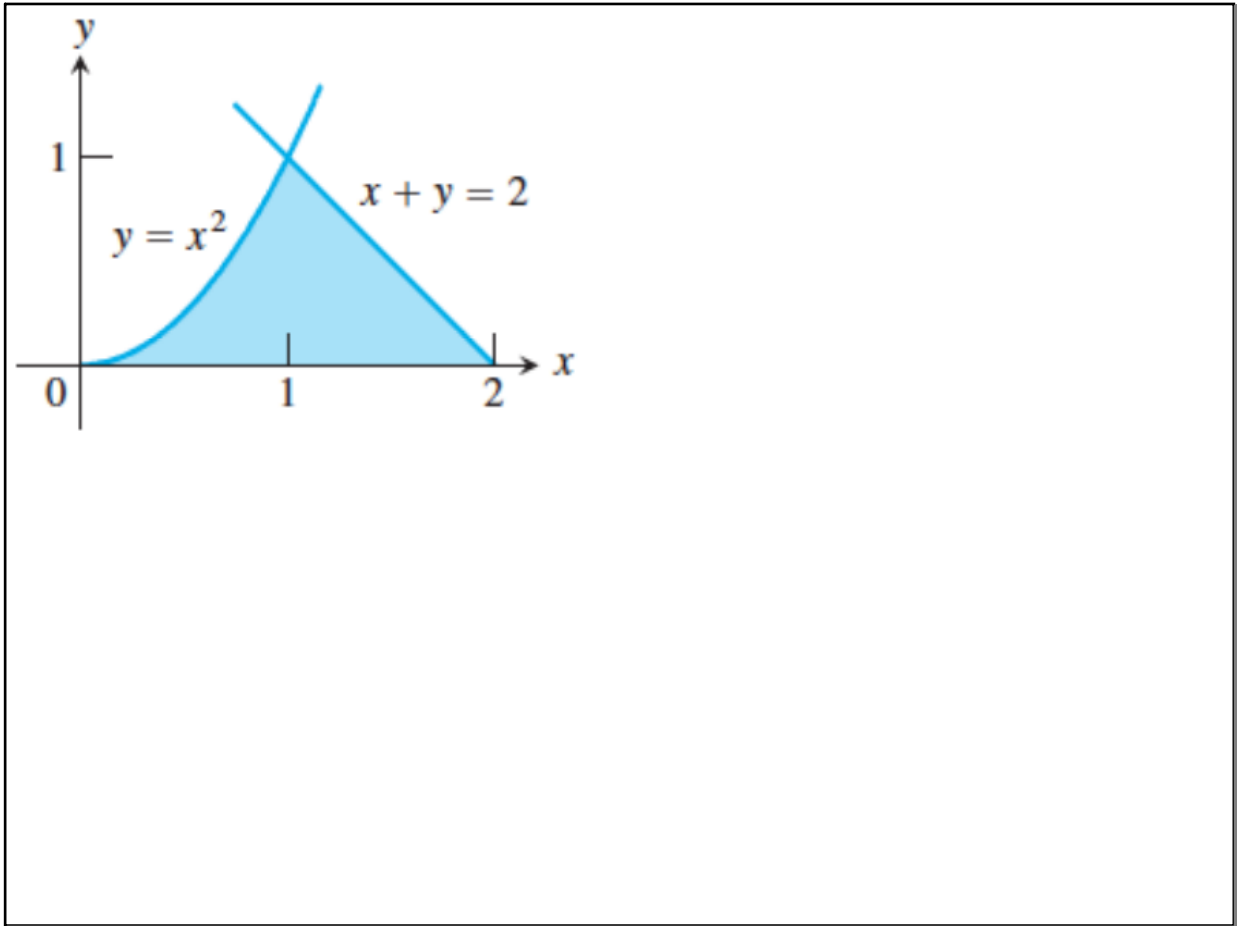
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$$\int_{-1}^1 (x^2 + 2x^4) dx \approx 1.466$$

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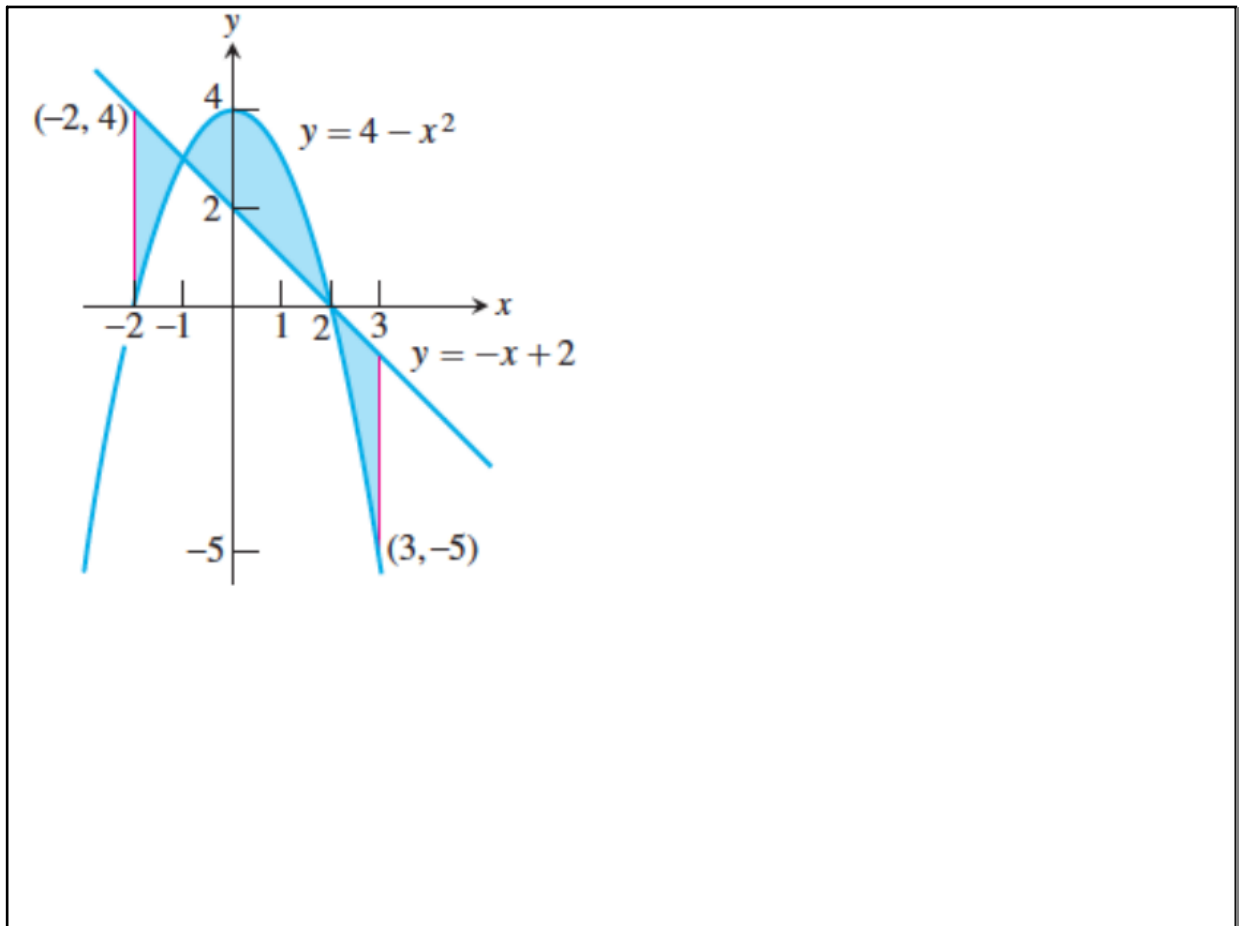
$\int_0^1 x^2 dx + \int_1^2 (-x + 2) dx \approx 0.833$

or

$\int_0^1 (-y + 2 - \sqrt{y}) dy \approx 0.833$

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The graph from the previous figure is shown again, but with an additional intersection point $(-1, 3)$ marked with a red dot. The shaded regions are now divided into three parts: from $x = -2$ to $x = -1$, from $x = -1$ to $x = 2$, and from $x = 2$ to $x = 3$. The point $(2, 0)$ is also marked with a red dot. The y-axis has tick marks at 2, 4, and -5. The x-axis has tick marks at -2, -1, 1, 2, and 3.

$$f(x) = 4 - x^2$$

$$g(x) = -x + 2$$

$$\int_{-2}^{-1} (g(x) - f(x)) dx + \int_{-1}^2 (f(x) - g(x)) dx + \int_2^3 (g(x) - f(x)) dx$$

$$\approx 1.833 + 4.5 + 1.833 = 8.167$$

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