Area of a Region Between Two Curves

Assume $f(x) \geq g(x)$ on $[a, b]$:

Area of a Region Between Two Curves:

If f and g are continuous on $[a, b]$ and $g(x) \leq f(x)$ for all x in $[a, b]$, then the area of the region bounded by the graphs of f and g and the vertical lines $x = a$ and $x = b$ is

$$A = \int_a^b [f(x) - g(x)]dx$$

1. Find the area between $f(x) = x^2 + 2x + 1$ and $g(x) = 2x + 5$

2. Set up the area integral between $f(x) = (x-1)^3$ and $g(x) = x - 1$

3. Set up the area integral between $y = x^2$ and $y = 6 - x$

4. Set up the area integral of the region between
$$f(x) = sinx,\ g(x) = cos2x,\ \ -\tfrac{\pi}{2} \leq x \leq \tfrac{\pi}{2}$$

5. Find the area of the region bounded by
$$g(x) = \tfrac{4}{2-x},\ y = 4,\ x = 0$$

6. Find the area of the region bounded by
$$f(y) = y^2 + 1,\ g(y) = 0,\ y = -1,\ y = 2$$

7. Find the area of the region bounded by the curves $x = -y^2 + 2y$ and $x = -y$.

8. Find b such that the line $y = b$ divides the region bounded by the graphs of the equations listed into two regions of equal area.

   $y = 9 - \sqrt{x}$, $y = 0$ and $x = 0$.

9. A state legislator is debating two proposals for eliminating the annual budget deficits by the year 2010. The rate of decrease for each proposal is shown in the figure. From the viewpoint of minimizing the cumulative federal deficit, which is the better proposal?