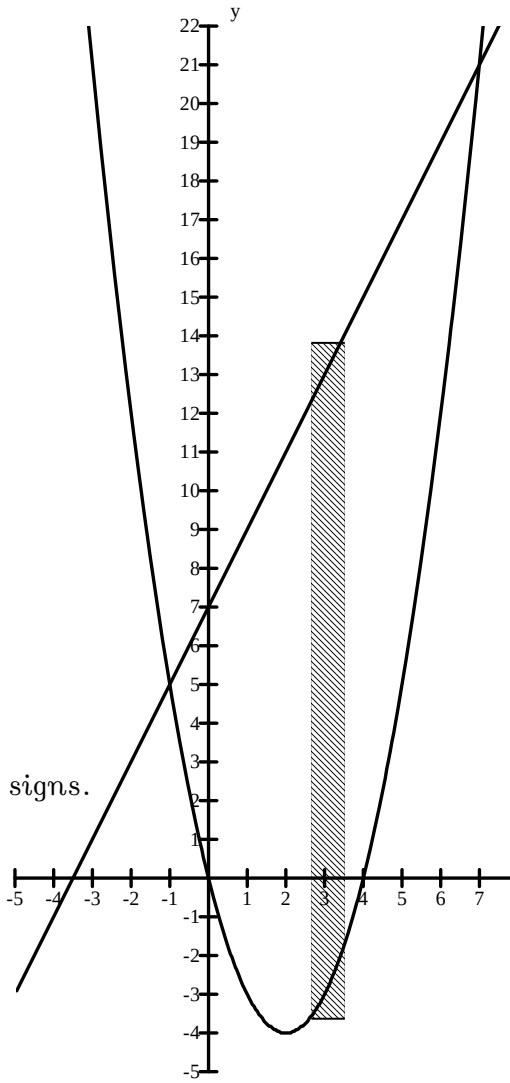
www.tomsmath.com Find the area between the curves $f(x)=x^2-4x$ and $g(x)=2x+7$

1) The height of the rectangle is $g(x)-f(x)=2x+7-1(x^2-4x)$



2) Simplify this expression first.

$g(x)-f(x)=2x+7-x^2+4x$ Distribute the -1 in front of the parenthesis

$g(x)-f(x)=-x^2+2x+4x+7$ Group like terms

$g(x)-f(x)=-x^2+6x+7$ Add like terms. This is the integrand.

3) Find the limits of integration by solving for the two x's where the curves meet.

$2x+7=x^2-4x$ Setup the equation.

$-x^2+2x+4x+7=0$ Move terms from the right to the left

$-x^2+6x+7=0$ Simplify by adding 2x and 4x.

$x^2-6x-7=0$ Divide the whole equation by -1. This changes the signs.

$(x-7)(x+1)=0$ Factor the equation.

$x=7$ or $x=-1$ These are the limits of integration.

4) Setup the integral, and integrate using the power rule.

$$\int_{-1}^{7} -x^2+6x+7\,dx=\frac{-1}{3}x^3+3x^2+7x\Big]_{-1}^{7}$$

$$=\left(\frac{-1}{3}\cdot 7^3+3\cdot 7^2+7(7)\right)-\left(\frac{-1}{3}\cdot(-1)^3+3\cdot(-1)^2+7(-1)\right)$$

$$=\left(\frac{-1}{3}(343)+3\cdot 49+49\right)-\left(\frac{1}{3}+3-7\right)$$

$$=\frac{-343}{3}+147+49-\frac{1}{3}-3+7$$

$$=\frac{-343}{3}+\frac{441}{3}+\frac{147}{3}-\frac{1}{3}-\frac{9}{3}+\frac{21}{3}$$

$$=\frac{256}{3}$$

(Whew!! Finally!) I know how you feel:)