4. (a) $\int_1^5 f(x)\,dx = \int_0^5 f(x)\,dx - \int_0^1 f(x)\,dx = 12 - 3 = \boxed{9}$

(b) $\int_1^4 78 f(x)\,dx = 78\int_1^4 f(x)\,dx = 78\left(\int_1^5 f(x)\,dx - \int_4^5 f(x)\,dx\right)$ but this is no help since we do not know $\int_4^5$ yet, so

$= 78\left(\int_0^4 f(x)\,dx - \int_0^1 f(x)\,dx\right) = 78(4-3)$

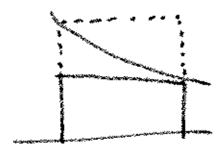
$= \boxed{78}$

5. Given $\int_2^5 4f(x) - 8g(x)\,dx = 4$ we get

$4 = 4\int_2^5 f(x)\,dx - 8\int_2^5 g(x)\,dx = 4(7) - 8\int_2^5 g(x)\,dx$, so

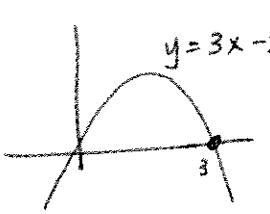
$8\int_2^5 g(x)\,dx = 28 - 4 = 24$. Hence $\int_2^5 g(x)\,dx = 24/8 = \boxed{3.}$

6. f decreasing $\Rightarrow$ left endpoint overestimates and right endpoint underestimates.



Intervals:	[0,2]		[2,3]		[3,5]		[5,6]		
Underestimate =	$5\cdot 2$	+	$4\cdot 1$	+	$1\cdot 2$	+	$(-2)\cdot 1$	$= 10+4+2-2 =$	$\boxed{14}$
Overestimate =	$8\cdot 2$	+	$5\cdot 1$	+	$4\cdot 2$	+	$1\cdot 1$	$= 16+5+8+1 =$	$\boxed{30}$

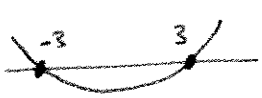
7.



Area $= \int_0^3 3x - x^2\,dx = \frac{3}{2}x^2 - \frac{1}{3}x^3\Big|_0^3$

$= \frac{3}{2}(3^2) - \frac{1}{3}(3^3) = 3^2\left(\frac{3}{2} - 1\right) = \frac{3^2}{2} = \boxed{\frac{9}{4}}$

8. $F(x) = \int_0^x f(t)\,dt$ has a local maximum if $F' = 0$ at that point, $F' > 0$ before, and $F' < 0$ after. Since $F' = f$, this happens at $x = -3$. and nowhere else.



$F' = f$

$\boxed{\text{At } x = -3.}$