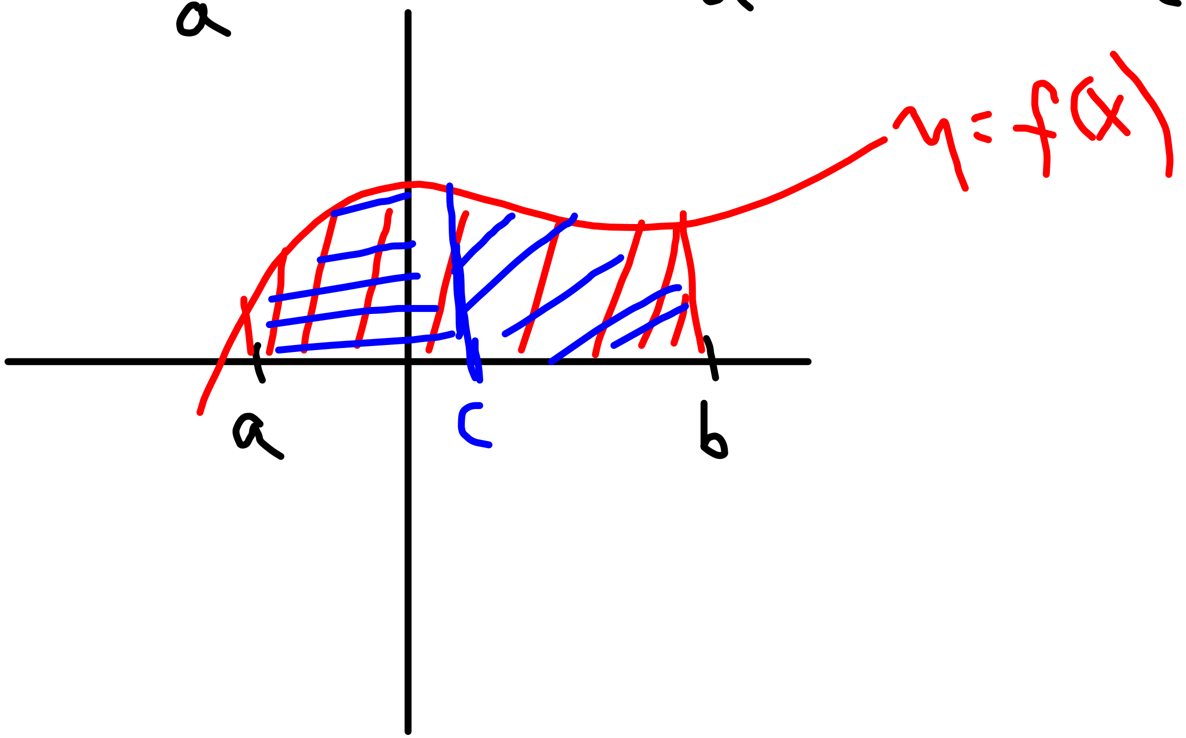
Let f be continuous on $[a, b]$

If c is in $[a, b]$ then:

$$\int_a^b f(x)\,dx = \int_a^c f(x)\,dx + \int_c^b f(x)\,dx$$



$$\frac{d}{dx}\underbrace{\int_5^{\sqrt{x}} t^2+e^t\,dt}_{y}$$

Let $u=\sqrt{x}$ $\quad \frac{du}{dx}=\frac{1}{2\sqrt{x}}$

$$\frac{dy}{dx}=\frac{dy}{du}\cdot\frac{du}{dx}$$

$$\frac{dy}{dx}=\frac{d}{du}\int_5^{u} t^2+e^t\,dt\cdot\frac{du}{dx}$$

$$=\left(u^2+e^u\right)\cdot\frac{1}{2\sqrt{x}}$$

$$=\frac{\sqrt{x}^2+e^{\sqrt{x}}}{2\sqrt{x}}$$

$$\frac{d}{dx}\int_5^{x} t^2+e^t\,dt$$

$$=x^2+e^x$$

Remember

$h(x)=\int_a^x f(t)\,dt$ so

$k(g(x))=\int_a^{g(x)} f(t)\,dt$

$$\frac{d}{dx}\int_{2x}^{x^2} 3t\,dt$$

$$\frac{d}{dx}\left[\int_{2x}^{r} 3t\,dt + \int_{r}^{x^2} 3t\,dt\right]$$

$$\frac{d}{dx}\left[\int_{r}^{x^2} 3t\,dt - \int_{r}^{2x} 3t\,dt\right]$$

$$3x^2 \cdot 2x - 3(2x)\cdot 2$$

$$6x^3 - 12x$$

Mean Value Theorem for Definite Integrals.

If f is continuous on $[a,b]$ there is some point c in $[a,b]$ such that

$$f(c) = \frac{1}{b-a}\int_a^b f(x)\,dx$$