October 31

SWBAT:

Apply Definite Integrals to a variety of problems.

One Part:	
How to evaluate a definite integral	$\int_a^b f(x)\,dx = F(x)\Big\vert_a^b = F(b)-F(a)$
	$\frac{d}{dx}(?) = f(x)$
	$? = F(x)$
	$\int_1^4 2x - \frac{1}{x}\,dx = x^2 - \ln(x)\Big\vert_1^4$
	$\frac{d}{dx}(?) = 2x - \frac{1}{x}$
	$? = \frac{2x^2}{2} - \ln(x)$
	$x^2 - \ln(x)$
	$= 4^2 - \ln(4) - (1^2 - \ln(1))$
	$= 16 - \ln(4) - (1 - 0)$
	$= 15 - \ln(4)$

The other part:

Taking the derivative of an integral

$$\frac{d}{dx}\left[\int_{g(x)}^{h(x)} f(t)\,dt\right]=$$

$$\frac{d}{dt}(?)=f(t)$$

$$?=F(t)$$

$$\frac{d}{dx}\left[\int_{g(x)}^{h(x)} f(t)\,dt\right]=\frac{d}{dx}\left[F(t)\Big|_{g(x)}^{h(x)}\right]$$

$$=\frac{d}{dx}\left[F(h(x))-F(g(x))\right]$$

$$F'(h(x))h'(x)-F'(g(x))g'(x)$$

$$=f(h(x))h'(x)-f(g(x))g'(x)$$

evaluate the original function at the upper bound, multiply by the derivative of the upper bound minus the original function evaluated at the lower bound, multiply by the derivative of the lower bound

$$\frac{d}{dx}\left(\int_{x^2}^{\cos x} \ln\left(\sqrt{t+1}\right)dt\right)$$

$$\ln\left(\sqrt{\cos x+1}\right)(-\sin x)-\ln\left(\sqrt{x^2+1}\right)(2x)$$