5B Integration.

Indefinite Integration - $\int f'(x)dx = f(x) + C$

Fundamental Theorem of Calculus

Area Definite Integration - $\int_a^b f'(x)dx = f(b) - f(a)$

Ex I $\int 4x^3 - 3x^2 + 5dx = \int 4x^3 - 3x^2 + 5x^0 dx$

$= \frac{4x^4}{4} - \frac{3x^3}{3} + \frac{5x^1}{1} + C = \boxed{x^4 - x^3 + 5x + C}$

You can check your answer by taking the derivative

Ex 2 $\int_0^1 4x^3 - 3x^2 + 5dx$

$x^4 - x^3 + 5x \Big|_0^1 \quad [(1)^4 - (1)^3 + 5(1)] - [(0)^4 - (0)^3 + 5(0)]$

$1 - 1 + 5 \quad - \quad 0$

Area under curve from $x=0$ to $x=1$ $= \boxed{5}$

LN integration

$\int \frac{u'}{u} = \ln|u| + C$

Ex $\int \frac{3}{4x-3} dx$

$\boxed{\frac{3}{4} \ln|4x-3| + C}$

u-subtitution

steps

1. Determine what has the most complicated operation being performed "make that u."
2. Take the derivative of u with respect to its variable
3. Solve for du
4. Make sure you have a "u" replacement for each term in original problem.
5. Create New Integral Interms of u.
6. Integrate
7. Replace your "u" with original substitution
8. Dont forget your + C

Ex) $\int x^2 (x^3-1)^4 dx$

Let $u = x^3 - 1$

$\frac{du}{dx} = 3x^2$

$du = 3x^2 dx$

$\frac{du}{3} = x^2 dx$

so

$\frac{1}{3}\int u^4 du$

$\frac{u^5}{15} + C$

$\boxed{\frac{(x^3-1)^5}{15} + C}$

2^{nd} Fundamental Theorem of Calculus

(Derivative of Integral)

Rule $G(x) = \int_c^{f(x)} g(t)\,dt$

$G'(x) = f'(x)\left[g(f(x))\right]$

Ex 1

$G(x) = \int_2^{4x} t^2 - 3\,dt$

$\boxed{G'(x) = 4\left[(4x)^2 - 3\right]}$

Ex 2)

$G(x) = \int_{3x}^{5} t^3 - 3t\,dt$

so $G(x) = -\int_5^{3x} t^3 - 3t\,dt$

Find $G'(1)$

$G'(x) = -3\left[(3x)^3 - 3(3x)\right]$

$G'(1) = -3\left[(3)^3 - 9\right]$

$= -3\left[27 - 9\right]$

$= -3\left[18\right]$

$\boxed{G'(1) = -54}$

FRQ Reference for 5B

2017	3 all	
2016	3 all	
2015	5 all	
2014	3 all	5d
2013	4 all	
2012	3 all	4d
2011	4 all	
2010	5 all	