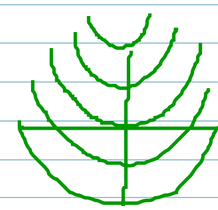
Antiderivative – F st $F'(x) = f(x)$, $\forall x \in I$ = Interval

$F'(x) = G'(x) = f(x)$
$F'(x) - G'(x) = 0$
$F(x) - G(x) = C$ = constant
$F(x) = G(x) + C$

Theorem
If F = Antiderivative of f on I: Interval,
then $F(x) + C$ is Most General Antiderivative, C = arbitrary constant
– C = constant of integration

$f'(x) = 2x$ $\qquad$ $f(x) = x^2 + C$



Common Antiderivatives

Function	Antiderivative
$kf(x)$	$kF(x) + C$
$f(x) \pm g(x)$	$F(x) \pm G(x) + C$
$x^n,\ n \neq -1$	$\frac{x^{n+1}}{n+1} + C$
$\frac{1}{x}$	$\ln\lvert x\rvert + C$
e^x	$e^x + C$
$\sin(x)$	$-\cos(x) + C$
$\cos(x)$	$\sin(x) + C$
$\sec^2(x)$	$\tan(x) + C$
$\sec(x)\tan(x)$	$\sec(x) + C$
$\frac{1}{\sqrt{1-x^2}}$	$\sin^{-1}(x) + C$
$\frac{1}{1+x^2}$	$\tan^{-1}(x) + C$

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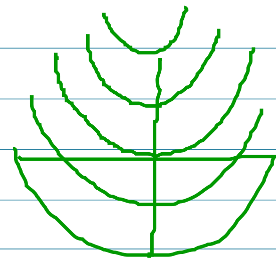

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$f(x) = 6x^5 - 10x^4 + 3x^{-1}$

$F(x) = \frac{6x^6}{6} - \frac{10x^5}{5} + 3\ln|x| + C = x^6 - 2x^5 + 3\ln|x| + C$

$f(x) = 5x^{3/2} - 7x^{-1/2}$

$F(x) = 5\frac{x^{5/2}}{\frac{5}{2}} - \frac{7x^{1/2}}{\frac{1}{2}} + C = 5 \cdot \frac{2}{5}x^{5/2} - 7 \cdot \frac{2}{1}x^{1/2} + C$

$= 2x^{5/2} - 14x^{1/2} + C$

$f(x) = \frac{3x^4 - 7x^2 + 2}{x^4} = \frac{3x^4}{x^4} - \frac{7x^2}{x^4} + \frac{2}{x^4} = 3 - 7x^{-2} + 2x^{-4}$

$F(x) = 3x - 7\frac{x^{-1}}{-1} + 2\frac{x^{-3}}{-3} + C = 3x + 7x^{-1} - \frac{2}{3}x^{-3} + C$

$= 3x + \frac{7}{x} - \frac{2}{3x^3} + C$

Rectilinear Motion

$s(t)$ = Position

$s'(t) = v(t)$ = velocity

$s''(t) = v'(t) = a(t)$ = acceleration

$a(t) = 6t - 4$

$v(0) = 7$

$s(0) = 15$

$v(t) = 3t^2 - 4t + C = 3t^2 - 4t + 7$

$s(t) = t^3 - 2t^2 + Ct + K = t^3 - 2t^2 + 7t + 15$

$v(0) = 7 = 3(0)^2 - 4(0) + C = 0 + C = C$

$s(0) = 15 = 0^3 - 2(0)^2 + 7(0) + K = 0 + K = K$

$v(1) = 7 = 3(1)^2 - 4(1) + C = 3 - 4 + C = -1 + C$ $\quad C = 8$

$s(1) = 15 = 1^3 - 2(1)^2 + 8(1) + K = 1 - 2 + 8 + K = 7 + K$ $\quad K = 8$

$v(t) = 3t^2 - 4t + 8$

$s(t) = t^3 - 2t^2 + 8t + 8$