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Warm up

a) $\int (2x+5)\,dx = x^2 + 5x + C$

b) $\int (3x^2 + 4x - 10)\,dx = x^3 + 2x^2 - 10x + C$

c) $\int (10x^4 + 6x^3 + 2)\,dx = 2x^5 + \frac{3}{2}x^4 + 2x + C$

d) $\int (-4x^5 + x^3 - 6x^2 + 2x)\,dx = -\frac{2}{3}x^6 + \frac{x^4}{4} - 2x^3 + x^2 + C$

e) $\int (x^3 + 12 - x^2)\,dx = \frac{x^4}{4} + 12x - \frac{x^3}{3} + C$

1. 5 minutes 6:27

a) $\int \frac{1}{2}x^3 = \frac{1}{8}x^4 + C$

b) $\int 3x^2 - 2\,dx = x^3 - 2x + C$

c) $\int 5x^3 - 2x\,dx = \frac{5}{4}x^4 - x^2 + C$

d) $\int \frac{4}{5}x^3 - 2x^2\,dx = \frac{1}{5}x^4 - \frac{2}{3}x^3 + C$

$\frac{(x-1)^3}{3}$

e) $\int (x-1)^2\,dx = \int x^2 - 2x + 1\,dx$

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

f) $\int x(x + \frac{1}{x})\,dx = \int x^2 + 1\,dx$

$= \frac{x^3}{3} + x + C$

g) $\int 2z^2(z-1)\,dz = \int 2z^3 - 2z^2\,dz$

$= \frac{1}{2}z^4 - \frac{2}{3}z^3 + C$

h) $\int (2t-3)^2\,dt = \int 4t^2 - 12t + 9\,dt$

$= \frac{4}{3}t^3 - 6t^2 + 9t + C$

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Antidifferentiation of exponentials

a) $\int e^{2x}\,dx = \frac{e^{2x}}{2} + c$

c) $\int e^{-x}\,dx = -e^{-x} + c$

b) $\int e^{4x}\,dx = \frac{e^{4x}}{4} + c$

d) $e^{-3x}\,dx = \frac{-e^{-3x}}{3} + c$

e) $\int 5e^{5x}\,dx = e^{5x} + c$

*divide by ~~[illegible]~~ derivative of power

Antidifferentiation of sine and cosine

a) $\int \sin(3x)\,dx = \frac{-\cos(3x)}{3} + c$

*divide by derivative of inside brackets

b) $\int \sin(4x)\,dx = \frac{-\cos(4x)}{4} + c$

c) $\int \cos(7x)\,dx = \frac{\sin(7x)}{7} + c$

* ~~[illegible]~~ remember to change your sin/cos

d) $\int \frac{\cos(2x)}{3}\,dx = \frac{\sin(2x)}{6} + c$

e) $\int \sin(-2x)\,dx = \frac{\cos(-2x)}{2} + c$

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Reverse Chain rule

a) $\int (x+3)^2\,dx = \frac{(x+3)^3}{3} + c$

b) $\int (x-5)^3\,dx = \frac{(x-5)^4}{4} + c$

☆ divide by derivative of inside bracket and new power

c) $\int 2(2x+1)^4 = 2\int (2x+1)^4\,dx$

$= 2 \times \frac{(2x+1)^5}{5\times 2} + c$

$= \frac{(2x+1)^5}{5} + c$

d) $\int -2(3x-4)^5\,dx = \frac{-2(3x-4)^6}{18} + c$

$= \frac{-(3x-4)^6}{9} + c$

e) $\int (6x+5)^4\,dx = \frac{(6x+5)^5}{30} + c$

Try this

a) $\int \frac{3}{x}\,dx = 3\ln(x) + c$

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Anti-Differentiation of logs

2.

a) $\int \frac{1}{(x+3)} dx = \ln(x+3) dx + c$

b) $\int \frac{3}{(x+3)} dx = 3\ln(x+3) dx + c$

c) $\int \frac{-2}{(x+4)} dx = -2\ln(x+4) dx + c$

d) $\int \frac{-6}{x+5} dx = -6\ln(x+5) + c$

e) $\int \frac{4}{3x+2} dx = \frac{4}{3}\ln(3x+2) + c$

* divide by derivative of whats inside ln( )

g) $\int 2e^{2x} + e^{-x} = e^{2x} - e^{-x} + c$ pt. (0,3)

$3 = e^{2\times 0} - e^{-x\times 0} + c$

$3 = 1 - 1 + c$

$3 = c \quad \therefore y = e^{2x} - e^{-x} + 3$

13) $f'(x) = 4e^{-2x} + K$, stat pt. $x=0$, $\therefore f'(0) = 0$

$0 = 4e^{0} + K$, $0 = 4 + K$, $K = -4$

$f'(x) = 4e^{-2x} - 4$

$f(x) = -2e^{-2x} - 4x + c$