November 12, 2025

National Pizza with Everything (Except Anchovies) Day

Today in History:

Ellis Island closes (1954)

The Destruction of Atlanta begins (1864)

Number of the Day: 1010

1010 = 2 x 5 x 101

1010 is the number of ways to tile a 5 x 12 rectangle with pentominoes.

Fun Fact:

Kissing for 1 minute can burn 26 calories.

Quote of the Day:

“I would have made a good Pope."

- Richard M. Nixon

Today’s Weather:

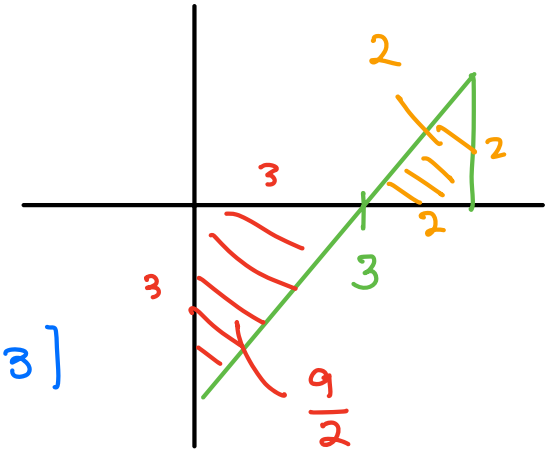
Cloudy and windy, with rain or snow possible, high 47°.

Math 121 - Quiz #39

Find the distance traveled if

$$v(t) = (t-3) \text{ m/s} \qquad 0 \le t \le 5 \text{ sec}$$

DIST TRAV. $= \int_0^5 |t-3|\,dt$



$= \int_0^3 |t-3|\,dt + \int_3^5 |t-3|$

$\frac{9}{2} + 2 = \frac{13}{2}$

$\left| \int_0^3 (t-3)\,dt \right| = \left| \frac{t^2}{2} - 3t \Big|_0^3 \right| = \left| \frac{9}{2} - 9 \right| = \left| -\frac{9}{2} \right| = \frac{9}{2}$

$\int_3^5 (t-3)\,dt = \frac{t^2}{2} - 3t \Big|_3^5 = \left(\frac{25}{2} - 15\right) - \left(\frac{9}{2} - 9\right) = 2$

$\frac{9}{2} + 2 = \frac{13}{2}$

SUBSTITUTION

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

$\frac{x^3}{3} + 2x^2 + 4x + C$

② $\int (x+2)^{50}\,dx$ $\quad u = x+2$

$\frac{du}{dx} = 1 \quad du = dx$

$= \int u^{50}\,du = \frac{u^{51}}{51} = \frac{(x+2)^{51}}{51} + C$

③ $\int \sqrt{x+2}\,dx$ $\quad u = x+2$

$du = dx$

$\int \sqrt{u}\,du = \frac{2u^{\frac{3}{2}}}{3} = \frac{2}{3}(x+2)^{\frac{3}{2}} + C$

④ $\int x\sqrt{x^2+1}\,dx$ $\quad u = x^2+1$

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

$du = 2x\,dx$

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

$= \int x\sqrt{u}\,\frac{du}{2x} = \frac{1}{2}\int \sqrt{u}\,du = \frac{1}{2}\cdot\frac{2}{3}u^{\frac{3}{2}}$

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

$\frac{1}{2}\int 2x\sqrt{x^2+1}\,dx$ $\quad u = x^2+1$, $du = 2x\,dx$

$\frac{1}{2}\int \sqrt{u}\,du$

(5) $\int \cos(7x+5)\,dx$ $\quad u = 7x+5$, $du = 7\,dx$, $dx = \frac{du}{7}$

$= \int \cos(u)\frac{du}{7}$ $= \frac{1}{7}\sin(u) = \frac{1}{7}\sin(7x+5)+C$

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(6) $\int x(x-1)^{10}\,dx$ $\quad u = x-1$, $du = dx$, $x = u+1$

$= \int x\,u^{10}\,du$

$= \int (u+1)u^{10}\,du = \int u^{11}+u^{10}\,du$

$= \frac{u^{12}}{12} + \frac{u^{11}}{11} = \frac{(x-1)^{12}}{12} + \frac{(x-1)^{11}}{11} + C$

(7) $\int \sin^4 x \cos x \, dx$

$u = \sin x$

$du = \cos x \, dx$

$dx = \frac{du}{\cos x}$

$= \int u^4 \cancel{\cos x} \frac{du}{\cancel{\cos x}} = \frac{u^5}{5} = \frac{\sin^5 x}{5} + C$

(8) $\int_0^{\frac{\pi}{4}} \tan x \sec^2 x \, dx$

$u = \tan x$

$du = \sec^2 x \, dx$

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

$= \int u \cancel{\sec^2 x} \frac{du}{\cancel{\sec^2 x}} = \frac{u^2}{2} = \frac{\tan^2 x}{2} \Big|_0^{\frac{\pi}{4}}$

$= \frac{1}{2}$

$\int_0^{\frac{\pi}{4}} \tan x \sec^2 x \, dx$

$u = \tan x$

$du = \sec^2 x \, dx$

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

$= \int_0^1 u \cancel{\sec^2 x} \frac{du}{\cancel{\sec^2 x}}$

$u = \tan x$

$x = 0 \quad \tan(0) = 0$

$x = \frac{\pi}{4} \quad \tan\left(\frac{\pi}{4}\right) = 1$

$\frac{u^2}{2} \Big|_0^1 = \frac{1}{2}$

(9) $\int \frac{1}{\sqrt{x}(\sqrt{x}+9)^2}\,dx$

$u = \sqrt{x} + 9$

$du = \frac{1}{2}x^{-\frac{1}{2}}\,dx$

$du = \frac{1}{2\sqrt{x}}\,dx$

$dx = 2\sqrt{x}\,du$

$= \int \frac{1}{\sqrt{x}\,u^2} 2\sqrt{x}\,du$

$= 2\int \frac{1}{u^2}\,du = 2\left(\frac{-1}{u}\right) = \frac{-2}{\sqrt{x}+9} + C$

(10) $\int \frac{\sqrt{\ln x}}{x}\,dx$

$u = \ln x$

$du = \frac{1}{x}\,dx$

$dx = x\,du$

$= \int \frac{\sqrt{u}}{x} x\,du = \frac{2u^{\frac{3}{2}}}{3} = \frac{2}{3}(\ln x)^{\frac{3}{2}} + C$