Name: Richard

QUIZ 24

MATH 200

November 20, 2025

1. $\int_1^2 (x^2+1)\,dx = \left[\frac{x^3}{3}+x\right]_1^2 = \left(\frac{2^3}{3}+2\right)-\left(\frac{1^3}{3}+1\right)$

$= \frac{8}{3}+2-\frac{1}{3}-1 = \frac{7}{3}+1 = \boxed{\frac{10}{3}}$

2. $\int_0^\pi \sin(x)\,dx = \left[-\cos(x)\right]_0^\pi = \left(-\cos(\pi)-(-\cos(0))\right)$

$= -(-1)-(-1) = \boxed{2}$

3. Find the area under the graph of $y = x^2$ between $x = 0$ and $x = 2$.

$\int_0^2 x^2dx = \left[\frac{x^3}{3}\right]_0^2 = \frac{2^3}{3}-\frac{0^3}{3} = \boxed{\frac{8}{3}\text{ sq. units}}$

4. Find the derivative of the function $F(x) = \int_1^x \frac{1+\cos(t)}{\sqrt{t+4}}\,dt$.

$\boxed{F'(x) = \frac{1+\cos(x)}{\sqrt{x+4}}}$

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5. Find the derivative of the function $y = \int_1^{x^2+x} \frac{1+\cos(t)}{\sqrt{t+4}}\,dt$.

$y = \begin{cases} \int_1^u \frac{1+\cos(t)}{\sqrt{t+4}}\,dt \\ u = x^2+x \end{cases}$

Use chain rule

$\frac{dy}{dx} = \frac{dy}{du}\cdot\frac{du}{dx} = \frac{1+\cos(u)}{\sqrt{u+4}}(2x+1) = \boxed{\frac{1+\cos(x^2+x)}{\sqrt{x^2+x+4}}(2x-1)}$

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1. $\int_{-1}^{1}(x^2+1)\,dx = \left[\frac{x^3}{3}+x\right]_{-1}^{1} = \left(\frac{1^3}{3}+1\right)-\left(\frac{(-1)^3}{3}+(-1)\right)$

$= \frac{1}{3}+1+\frac{1}{3}+1 = \frac{2}{3}+2 = \boxed{\frac{8}{3}}$

2. $\int_{0}^{1}\sqrt{x}\,dx = \int_0^1 x^{\frac{1}{2}}dx = \left[\frac{1}{\frac{1}{2}+1}x^{\frac{1}{2}+1}\right]_0^1 = \left[\frac{2}{3}x^{3/2}\right]_0^1$

$= \left[\frac{2}{3}\sqrt{x}^3\right]_0^1 = \frac{2}{3}\sqrt{1}^3 - \frac{2}{3}\sqrt{0} = \boxed{\frac{2}{3}}$

3. Find the area under the graph of $y=\sin(x)$ between $x=0$ and $x=\pi$.

$\int_0^{\pi}\sin(x)\,dx = \left[-\cos(x)\right]_0^{\pi} = -\cos(\pi)-(-\cos(0))$

$= -(-1)-(-1) = \boxed{2 \text{ sq. units}}$

4. Find the derivative of the function $F(x)=\int_1^x \frac{\sqrt{t+4}}{1+\cos(t)}\,dt$.

$F'(x) = \frac{\sqrt{x+4}}{1+\cos(x)}$

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5. Find the derivative of the function $y=\int_1^{\sin(x)} \frac{\sqrt{t+4}}{1+\cos(t)}\,dt$.

Use chain rule

$\begin{cases} y = \int_1^u \frac{\sqrt{t+4}}{1+\cos(t)}\,dt \\ u = \sin(x) \end{cases}$

$\frac{dy}{dx} = \frac{dy}{du}\frac{du}{dx} = \frac{\sqrt{u+4}}{1+\cos(u)}\cos(x) = \boxed{\frac{\sqrt{\sin(x)+4}\cdot\cos(x)}{1+\cos(\sin(x))}}$