13 $\int \frac{1}{\sqrt{2x+1}}dx = \int (2x+1)^{-1/2}dx$

$u = 2x+1$

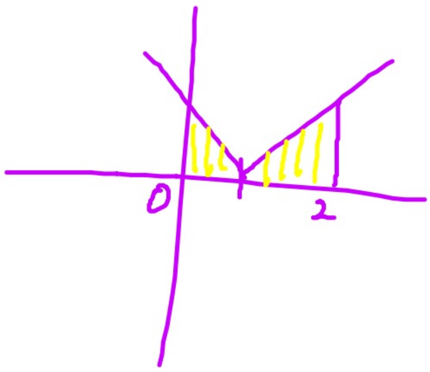
$du = 2dx$

$\frac{1}{2}\int u^{-1/2}\cancel{dx}$

$\frac{1}{2}\cdot\frac{u^{1/2}}{1/2} + C$

$\sqrt{2x+1} + C$

9 $\int_0^2 |x-1|dx$



$2\left(\frac{1}{2}bh\right)$

$2\left(\frac{1}{2}(1)(1)\right)$

(26) $2y' = y$

$$2\frac{dy}{dx} = y$$

$$\frac{2dy}{y} = dx$$

$$\int \frac{dy}{y} = \int \frac{1}{2}\,dx$$

$$e^{\ln|y|} = e^{\frac{1}{2}x + C}$$

$$y = e^{\frac{1}{2}x + C}$$

$$y = e^{\frac{1}{2}x} \cdot e^{C}$$

$$y = Ce^{x/2}$$

12 $\int x\sqrt{9-5x^2}\,dx = -\frac{1}{10}\int u^{1/2}\,du$

$u = 9-5x^2$

$du = -10x\,dx$

$$= -\frac{1}{10}\cdot\frac{u^{3/2}}{3/2} + C$$

$$= -\frac{1}{10}\cdot\frac{2}{3}\left(9-5x^2\right)^{3/2} + C$$

$$= -\frac{1}{15}\left(9-5x^2\right)^{3/2} + C$$

$$\int \frac{\sec^3\theta \tan\theta}{1+\tan^2\theta}\,d\theta. = \int \frac{\sec^3\theta\tan\theta}{\sec^2\theta}\,d\theta$$

$$\int \sec\theta\tan\theta\,d\theta = \sec\theta + C$$

Find the derivative: $f(x) = \ln \frac{x(x^2 + 2)}{\sqrt{x^3 - 7}}$.

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

$$f'(x) = \frac{1}{x} + \frac{2x}{x^2+2} - \frac{1}{2} \cdot \frac{3x^2}{x^3-7}$$

(18) $\displaystyle\int_1^{\sqrt{e}} \frac{-7}{x}\,dx = -7\ln|x|\Big]_1^{\sqrt{e}}$

$= -7\left(\ln\sqrt{e} - \ln 1\right)$

$\ln\frac{1}{2}$

$\ln 1 - \ln 2$

$0 - \ln 2$

$-\ln 2$

$= -7\ln\sqrt{e} = -7\ln e^{1/2}$

$= \frac{-7}{2}\cdot\ln e$

$= -\frac{7}{2}$

15. $\int x \sec^2 x^2 \, dx. = \frac{1}{2}\int \sec^2 u \, du$

$u = x^2$

$du = 2x \, dx$ $= \frac{1}{2} \tan u + C$

$= \frac{1}{2} \tan x^2 + C$

~~3D)~~ $y = \arcsin\sqrt{1-4x^2}$

$$\frac{u'}{\sqrt{1-u^2}}$$

$$y = \sqrt{1-4x^2}$$

$$y' = \frac{1}{2}\left(1-4x^2\right)^{-1/2} \cdot -8x$$

$$y' = \frac{-4x}{\sqrt{1-4x^2}}$$

e

$$y' = \frac{\dfrac{-4x}{\sqrt{1-4x^2}}}{\sqrt{1-\left(1-4x^2\right)}}$$

$$= \frac{\dfrac{-4x}{\sqrt{1-4x^2}}}{2x} = \frac{-2}{\sqrt{1-4x^2}}$$

$$y = \arccos 5x$$

$$y' = \frac{-5}{\sqrt{1-25x^2}}$$

$$\frac{-u'}{\sqrt{1-u^2}}$$

20. $\dfrac{ds}{dt} = \dfrac{\sec t \tan t}{\sec t + 5}$.

$u = \sec t + 5$

$du = \sec t \tan t \, dt$

$$S = \int \frac{\sec t \tan t}{\sec t + 5} dt$$

$$S = \int \frac{du}{u}$$

$$S = \ln|\sec t + 5| + C$$

21 $y = \ln(e^{-x^2})$

$y = -x^2 \cdot \ln e$

$y = -x^2$

$y' = -2x$

$\ln x^5 = 5 \ln x$

27. The number of fruit flies increases according to the law of exponential growth. If initially there are 10 fruit flies and after 6 hours there are 24, find the number of fruit flies after t hours.

(a) $y = 10e^{\ln(12/5)t/6}$

(b) $y = 10e^{\ln(12/5)t}$

(c) $y = 10e^{-\ln(12/5)t/6}$

(d) $y = 10e^{(\ln 12)t/6}$

(e) None of these

$y = Ce^{kt}$

$(0, 10)$

$(6, 24)$

$10 = Ce^{0}$

$10 = C$

$24 = 10e^{6k}$

$\ln\frac{24}{10} = \ln e^{6k}$

$\ln\frac{12}{5} = 6k$

$\frac{1}{6}\ln\frac{12}{5} = k$

$\boxed{y = 10e^{\left(\frac{1}{6}\ln\frac{12}{5}\right)t}}$

$$\int_{4}^{1} f(x)\,dx = 8 \qquad \int_{1}^{4} f(x)\,dx = -8$$

10.) $\frac{1}{2}\int_0^2 (2x^2+3)\,dx = \frac{1}{2}\left(\frac{2x^3}{3}+3x\right)\Big]_0^2$

$= \frac{1}{2}\left(\frac{2\cdot 8}{3}+6\right)$

$= \frac{1}{2}\left(\frac{16}{3}+6\right)$

$\frac{34}{6} = \frac{17}{3}$

Find $\frac{dy}{dx}$ if $xe^y + 1 = xy$.

$$x \cdot e^y \frac{dy}{dx} + e^y \cdot \frac{dx}{dx} + 0 = x\frac{dy}{dx} + y \cdot \frac{dx}{dx}$$

$$xe^y \frac{dy}{dx} + e^y = x\frac{d\cancel{y}}{dx} + y$$

$$xe^y \frac{dy}{dx} - x\frac{dy}{dx} = y - e^y$$

$$\frac{dy}{dx} = \frac{y - e^y}{xe^y - x}$$

24. Find the slope of the tangent line to the graph of $y = (\ln x)e^x$ at the point where $x = 2$.

(a) $\frac{1}{2}e^2$ (b) $e^2\left(\ln 2 + \frac{1}{2}\right)$ (c) e

(d) $e(2 \ln 2 + 1)$ (e) None of these

$$y' = \ln x \cdot e^x + e^x \cdot \frac{1}{x}$$

$$y'(2) = \ln 2 \cdot e^2 + \frac{e^2}{2}$$

23. Find the general solution to the first order differential equation: $2x(y+1) - yy' = 0$.

(a) $2x^2 - y^2 \ln|y+1| = C$

(b) $x^2 = y + \dfrac{1}{(y+1)^2} + C$

(c) $\ln|y+1| + x^2 - y = C$

(d) $x^2(y+1)^2 - y^2 = C$

(e) None of these

$$2x(y+1) = y\frac{dy}{dx}$$

$$2x\,dx = \frac{y}{y+1}\,dy$$

$$\int 2x\,dx = \int\left(1 - \frac{1}{y+1}\right)dy$$

$$x^2 = y - \ln|y+1| + C$$

$$\begin{array}{r|l} & 1 \\ \hline y+1 & y \\ & -y-1 \\ \hline & -1 \end{array}$$

Consider $F(x) = \int_1^{x^2} \left(t^3 + \sqrt{t}\right) dt$. Find $F'(x)$.

$$F'(x) = \left(x^6 + x\right) \cdot 2x$$

2nd FTC

Trapezoidal Rule

$$y = x^2 + 1 \qquad [0, 4] \qquad n = 4$$

$$\Delta x = w = \frac{b-a}{n} = 1 \text{ (height)}$$

$$A = \frac{1}{2}h(b_1 + b_2)$$

$$\frac{1}{2}(1)\left[f(0)+f(1)+f(1)+f(2)+f(2)+f(3)+f(3)+f(4)\right]$$

$$\frac{1}{2}\left[1+2+2+5+5+10+10+17\right]$$