

1. ¹⁹⁹⁸ C	9. D	17. D	26. \bar{E}
2. A	10. \bar{E}	18. B	27. D
3. D	11. A	19. D	28. C
4. A	12. \bar{E}	20. \bar{E}	
5. A	13. B	21. C	
6. E	14. \bar{E}	22. A	
7. \bar{E}	15. B	23. E	
8. B	16. C	24. C	
		25. C	

$$3. \quad y^2 + (xy + 1)^3 = 0 \quad (2, -1)$$

$$2y \frac{dy}{dx} + 3(xy + 1)^2 (x \frac{dy}{dx} + y) = 0$$

$$-2 \frac{dy}{dx} + 3(1) (2 \frac{dy}{dx} - 1) = 0$$

$$-2 \frac{dy}{dx} + 6 \frac{dy}{dx} - 3 = 0$$

$$\cancel{4} \frac{dy}{dx} = \frac{3}{4}$$

$$\int_1^e \left(\frac{x^2}{x} - \frac{1}{x} \right) dx$$

$$\left(\frac{x^2}{2} - \ln x \right) \Big|_1^e$$

8. $\int \frac{dy}{dx} = \sin x \cos^2 x$

$$\begin{array}{l} y=0 \quad x=\frac{\pi}{2} \\ y= \quad \quad x=0 \end{array}$$

$$y = \int u^2 (-du)$$

$$\begin{array}{l} u = \cos x \\ du = -\sin x dx \end{array}$$

$$y = -\frac{u^3}{3} + C$$

$$y = -\frac{(\cos x)^3}{3} + C$$

$$0 = 0 + C$$

$$y = -\frac{(\cos x)^3}{3}$$

$$y = -\frac{1}{3}$$

11.

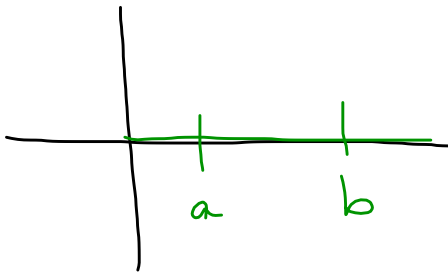
$$f(x) = x$$

$$f'(x) = 1$$

$$f''(x) = 0$$

$$\int_a^b 0 \, dx = c \Big|_a^b$$

$$c - c = 0$$



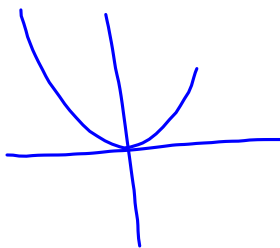
16.

$$f(x) = 3x^5 - 5x^4$$

$$f'(x) = 15x^4 - 20x^3$$

$$f''(x) = 60x^3 - 60x^2 = 0$$

$$60x^2(x-1) = 0$$



$x = 0, 1$
 ↑ no sign change ↑ yes sign change

17.

$$f(1) = 0$$

$$f'(1) = +$$

$$f''(1) = -$$

18.

$$\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n}$$

$$\frac{-1}{1} + \frac{1}{2} + \frac{-1}{3} + \frac{1}{4}$$

20.

$$\sqrt[3]{x}$$

$$\frac{1}{3} x^{-\frac{2}{3}} = \frac{1}{K}$$

$$\frac{1}{3(8)^{\frac{2}{3}}} = \frac{1}{K}$$

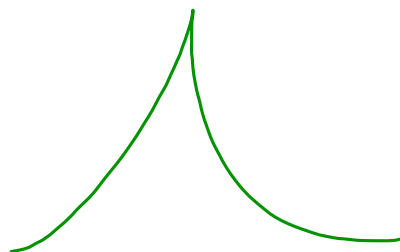
$$\frac{1}{12} = \frac{1}{K}$$

19.

$$r = 4 \sin \theta \quad r = 2$$

$$4 \sin \theta = 2$$

$$\sin \theta = \frac{1}{2}$$



$$25. \int_0^{\infty} x^2 e^{-x^3} dx \quad \begin{array}{l} u = -x^3 \\ du = -3x^2 dx \end{array}$$

$$\int \cancel{x^2} e^u \frac{du}{-3\cancel{x^2}}$$

$$-\frac{1}{3} \int e^u du$$

$$\lim_{b \rightarrow \infty} \left(-\frac{1}{3} e^u \right) \Big|_0^b$$

$$\lim_{b \rightarrow \infty} \left(\cancel{-\frac{1}{3} e^b} - \left(-\frac{1}{3} e^0 \right) \right) = \frac{1}{3}$$

26.

$$\frac{dP}{dt} = kP(m-P) \quad (0, 3000)$$

$$\frac{dP}{dt} = P \left(2 - \frac{P}{5000} \right)$$

$$\frac{dP}{dt} = \frac{1}{5000} P (10,000 - P)$$

27.

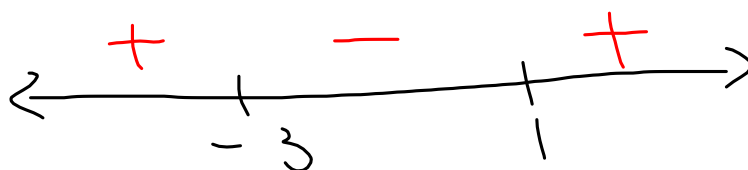
$$\sum_{n=0}^{\infty} a_n x^n = f(x)$$

$$\sum_{n=1}^{\infty} a_n n x^{n-1} = f'(x)$$

$$\sum_{n=1}^{\infty} a_n n = f'(1)$$

1.

$$3x^2 + 6x - 9 = 0$$
$$3(x^2 + 2x - 3) = 0$$
$$3(x - 1)(x + 3) = 0$$
$$x = 1, -3$$



$$3. \quad y^2 + (xy + 1)^3 = 0 \quad (2, -1)$$

$$2(y) \frac{dy}{dx} + 3(xy + 1)^2 (2 \frac{dy}{dx} + (y)) = 0$$

$$-2 \frac{dy}{dx} + 3(-1)^2 (2 \frac{dy}{dx} - 1) = 0$$

$$-2 \frac{dy}{dx} + 6 \frac{dy}{dx} - 3 = 0$$

$$\cancel{4} \frac{dy}{dx} = \frac{3}{4}$$

$$h(x) = f(g(x))$$

$$h' = \underbrace{f'(g(x))} \cdot \underbrace{g'(x)}$$

$$h'' = f'(g(x)) g''(x) + g'(x) (f''(g(x)) \cdot g'(x))$$

7.

$$\int_1^e \frac{x^2 - 1}{x} dx$$

$$\int_1^e x - \frac{1}{x} = \left(\frac{x^2}{2} - \ln x \right) \Big|_1^e$$

$$8. \quad \int \frac{dy}{dx} = \int \sin x \cos^2 x \quad \left(\frac{\pi}{2}, 0 \right)$$

$$u = \cos x \\ du = -\sin x dx$$

$$y = \int u^2 (-du)$$

$$y = -\frac{u^3}{3} + C$$

$$y = -\frac{(\cos^3 \frac{\pi}{2})}{3} + C$$

$$0 = C$$

$$y = -\frac{\cos^3 x}{3} \Big|_{x=0} = -\frac{1}{3}$$

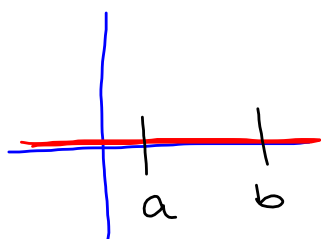
11.

f is linear

$$f(x) = x$$

$$f'(x) = 1$$

$$f''(x) = 0$$



$$\int_a^b$$

$$0 = c \Big|_a^b$$

$$= c - c = 0$$

12.

$$\ln x \Big|_{x=2} = \ln 2$$

$$x^2 \ln 2 \Big|_{x=2} = 4 \ln 2$$

14. 5th degree

$\sin x$ @ $x=0$

$$x - \frac{x^3}{3!} + \frac{x^5}{5!}$$

16.

$$f(x) = 3x^5 - 5x^4$$

$$f'(x) = 15x^4 - 20x^3$$

$$f''(x) = 60x^3 - 60x^2 = 0$$

$$60x^2(x-1) = 0$$

$$x = 1, 0$$



18.

$$\sum_{n=1}^{\infty} \frac{n}{n+2} \quad \text{div.}$$

$$\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n} \quad \text{con.}$$

$$-\frac{1}{1} + \frac{1}{2} + \frac{-1}{3} + \frac{1}{4} \dots$$

19.

$$\frac{1}{2} \int R^2 - r^2$$

$$\frac{1}{2} \int (4 \sin^2 \theta) - 2^2$$

$$\frac{1}{2} \int 16 \sin^2 \theta - 4$$

$$4 \sin \theta = \frac{2}{4}$$

$$\sin \theta = \frac{1}{2}$$

20.

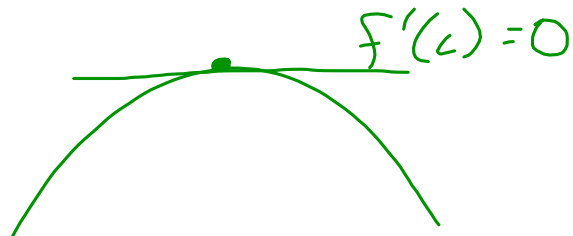
$$\sqrt[3]{x}$$

$$\frac{1}{3} x^{-\frac{2}{3}} = \frac{1}{K} \left(\frac{dx}{dx} \right)$$

$$\frac{1}{3 \cdot 8^{\frac{2}{3}}} = \frac{1}{K}$$

$$\frac{1}{12} = \frac{1}{K}$$

23.



25.

$$\int_0^{\infty} x^2 e^{-x^3} dx$$

$$u = -x^3$$

$$\frac{du}{-3x^2} = -3x^2 dx$$

$$\int x^2 e^u \frac{du}{-3x^2}$$

$$-\frac{1}{3} \int e^u du$$

$$\lim_{b \rightarrow \infty} \left(\left. \begin{array}{l} -\frac{1}{3} e^u \\ -\frac{1}{3} e^{-x^3} \end{array} \right|_0^b \right)$$

$$\lim_{b \rightarrow \infty} \left(\cancel{\frac{-1}{3} e^b} + \left(+\frac{1}{3} e^0 \right) \right) = \frac{1}{3}$$

$$26. \frac{dP}{dt} = kP(m - P)$$

(0, 3000)

$$\frac{dP}{dt} = P \left(2 - \frac{P}{5000} \right)$$

$$\frac{dP}{dt} = \frac{1}{5000} P (10000 - P)$$

$$27. \sum_{n=0}^{\infty} a_n x^n = f(x)$$

$$\sum_{n=1}^{\infty} a_n \cdot n x^{n-1} = f'(x)$$

$$\sum_{n=1}^{\infty} a_n \cdot n = f'(1)$$