9/27

If $f'(x) = x^5$

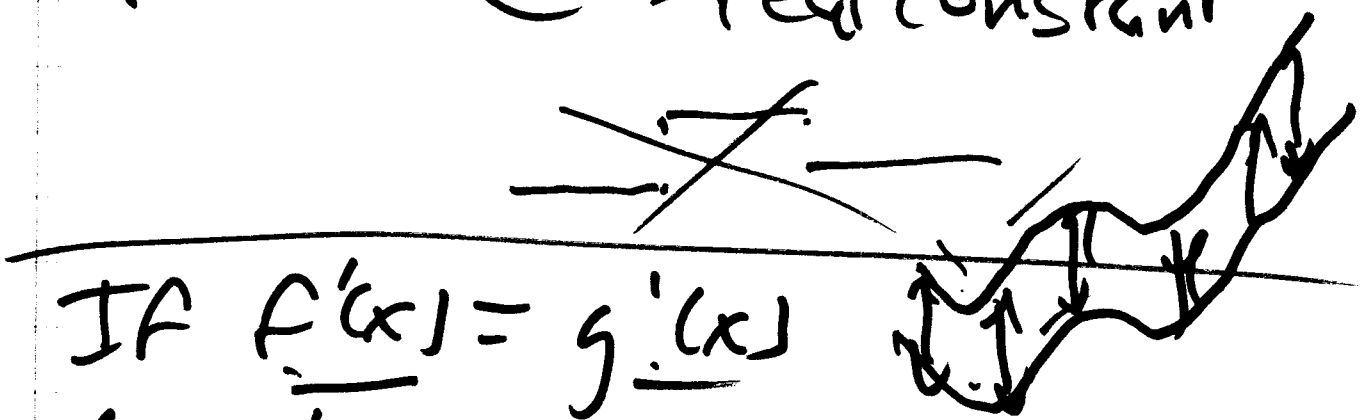
then $f(x) = \frac{x^6}{6} + 7$?

$+C$

$-\pi$

If $f'(x) = 0$

$f(x) = C \rightarrow$ real constant (Theorem)



If $f'(x) = g'(x)$

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

$(f-g)(x) = C \Rightarrow f(x) = g(x) + C$

$f'(x) = 1 \quad f(x) = 1x + C$

$f''(x) = 1 \quad f'(x) = 1x + C_1$

$(f')'(x) \quad f(x) = \frac{x^2}{2} + C_1 x + C_2$

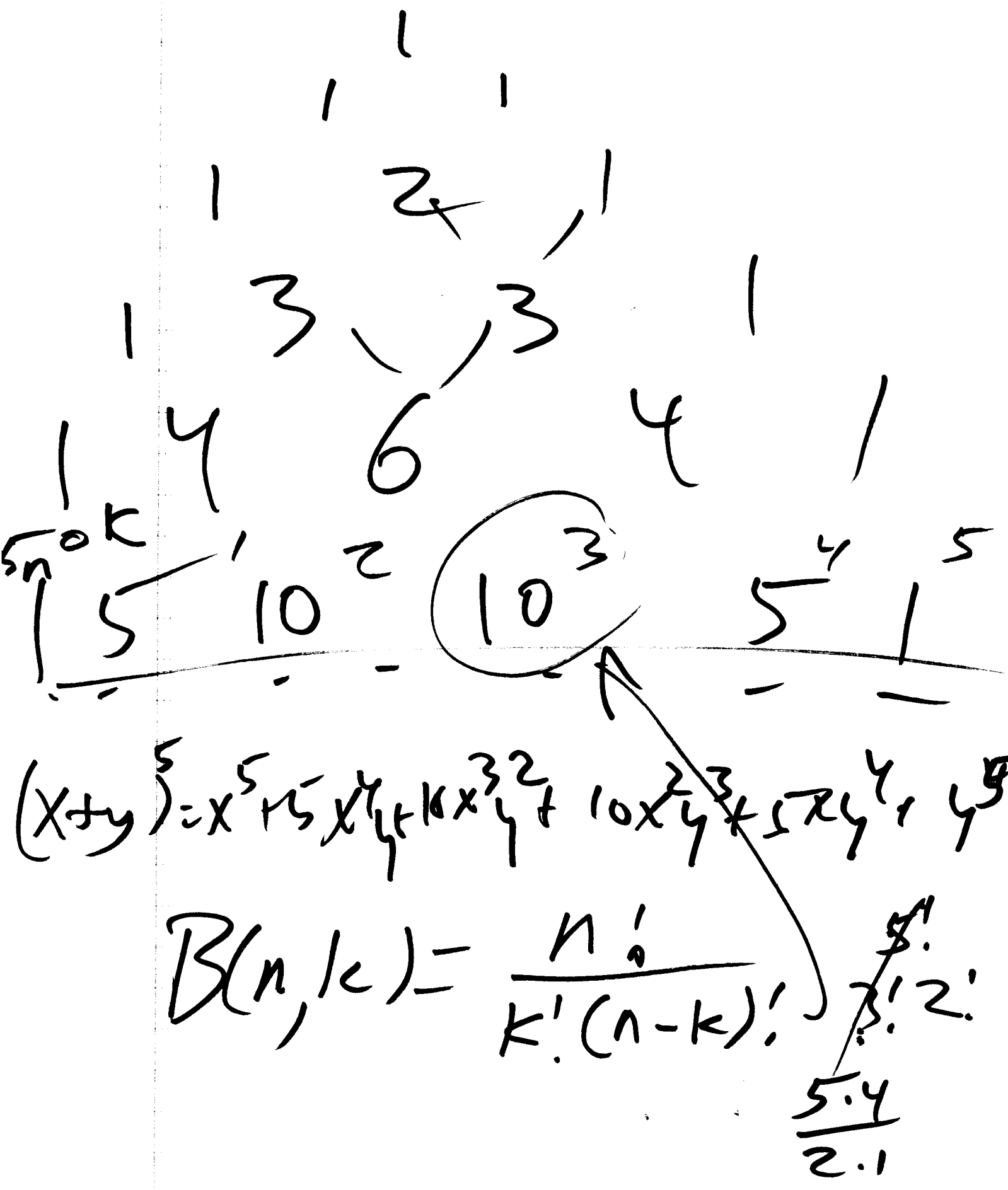
$f(x) = x^2 \quad f'(x) = 2x \quad f''(x) = 2$

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

$\frac{x^3}{6} \to \frac{x^4}{1 \cdot 2 \cdot 3 \cdot 4} \quad \frac{x^4}{24} + C$

Factorial $\frac{x^4}{24} \to \frac{x^5}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5} = 5!$

$\text{Fac}(5)$



$$(x+y)^5 = x^5 + 5x^4y + 10x^3y^2 + 10x^2y^3 + 5xy^4 + y^5$$

$$B(n,k) = \frac{n!}{k!(n-k)!}$$

$$\frac{5!}{3!2!} = \frac{5 \cdot 4}{2 \cdot 1}$$

1/8 3/8 3/8 1/8

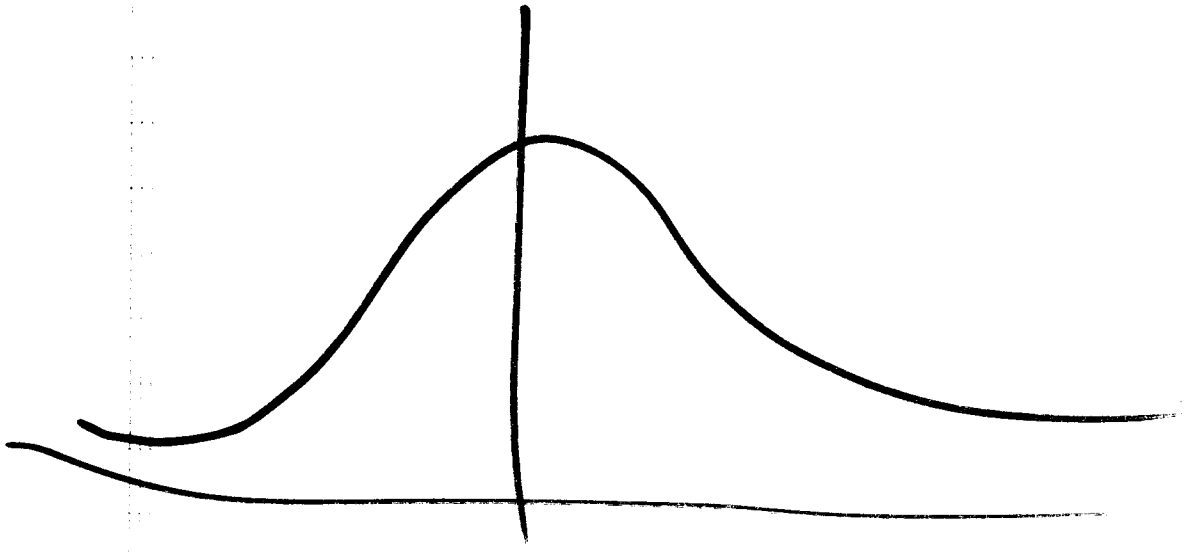
HHHH HHT HTT TTT

HTH THT

THH

1 6 1

1 5 10 10 5 1



$1, x, \frac{x^2}{2!}, \frac{x^3}{3!}, \frac{x^4}{4!} \ldots$

If $f(x) = x^n$

$f'(x) = n x^{n-1}$

$$\frac{d}{dx} x^n = n x^{n-1}$$

$y = x^n$

$$\frac{d(y)}{dx} = \lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x}$$

a b

$\frac{d}{dx} \cos x = -\sin x$

$\frac{d}{dx} \sin x = \cos x$

$$\frac{d}{dx}\left(\frac{x^{100}}{100!}\right) = 100\,\frac{x^{99}}{100!}$$

$$= \frac{x^{99}}{99!}$$

$f(x) = 3 - 5x + 7\frac{x^2}{2} + 11\frac{x^3}{6} - 13\frac{x^4}{4!}$

$f(0) = 3$

$f'(x) = -5 + 7x + 11\frac{x^2}{2} - 13\frac{x^3}{6}$

$f'(0) = -5$

$f''(x) = 7 + 11x - 13\frac{x^2}{2!}$

$f''(0) = 7$

$f'''(x) = 11 - 13x$

$f'''(0) = 11$

$f^{(4)}(x) = -13$

$f^{(4)}(0) = -13$

$f(0) = 1 \quad f'(0) = 1 \quad f''(0) = 1 \quad f'''(0) = 1$

$f(x) = 1 + 1x + 1\frac{x^2}{2!} + 1\frac{x^3}{3!} + 1 \cdots$

$y' = y$ $y(0) = 1$

$y'(0) = 1$

$y'' = y'$ $y''(0) = 1$

$y''' = y''$ $y'''(0) = 1$

$$y(x) = 1 + 1x + 1\frac{x^2}{2!} + 1\frac{x^3}{3!} + 1\frac{x^4}{4!} + \dots$$

$e^x =$

$e = e^1 = 1 + 1 + \frac{1}{2} + \frac{1}{6} + \frac{1}{24} + \frac{1}{120} + \dots$

$$\int x^n \, dx = \frac{x^{n+1}}{n+1} + C$$

$$x^2 \Rightarrow \frac{x^3}{3}$$

Except: $n = -1$

$$x^0 \Rightarrow \cancel{0x^{-1}}$$

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

$$= \ln x + C$$

$$e^x = 1 + x + \frac{x^2}{2} + \frac{x^3}{3!} + \frac{x^4}{2!} + \cdots$$

$$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots$$

$$\langle \cos, \sin \rangle = \langle \sin, -\cos \rangle$$

$$\cos x = 1 + 0x - \frac{1}{2}x^2 + \frac{0}{3!}x^3 + \frac{1}{4!}x^4 + \frac{0}{5!}x^5 + \cdots$$

$\sin$ 0 1 0 -1 0 1 0 -1

$$\cos(1) = 1 - \frac{1}{2} + \frac{1}{24} - \frac{1}{720} + \cdots$$