

$$|w-z| \geq ||w|-|z|| \geq \frac{|w|}{2}, \quad |w| > 2|z| \quad \text{p.f.}$$

$$\sum_{|w| > 2|z|} \frac{1}{|z-w|^k} < \sum_{|w| > 2|z|} \left(\frac{1}{2|z|}\right)^k < \infty$$

לכן k מספיק גדול $\Rightarrow$ $f_k(z) \sim \frac{1}{z^k} + O(|z|)$

$$f_k(z) \sim \frac{1}{z^k} + O(|z|)$$

לכן $k > 2$ מספיק גדול $\Rightarrow$ $f_k(z) \sim \frac{1}{z^k}$

לכן $f_k(z+w_0) = f_k(z)$, $w_0 \in L$ לכל $z \in \mathbb{C}$

$$f_k(z+w_0) = \sum_{w \in L} \frac{1}{(z+w_0-w)^k} = \sum_{w' \in L} \frac{1}{(z-w')^k} = f_k(z)$$

לכן $f_k(z) \sim \frac{1}{z^k}$ (כאשר $z \rightarrow 0$)

Weierstrass k ρ מספיק גדול

$$\beta(z; L) := \frac{1}{z^2} + \sum_{0 \neq w \in L} \left[\frac{1}{(z-w)^2} - \frac{1}{w^2} \right]$$

לכן $\beta(z; L) \sim \frac{1}{z^2}$ (כאשר $z \rightarrow 0$)

$$\left| \frac{1}{(z-w)^2} - \frac{1}{w^2} \right| = \left| \frac{w^2 - (z-w)^2}{w^2(z-w)^2} \right| \leq \frac{|w|}{|w|^4} = \frac{1}{|w|^3}$$

$$\sum_{0 \neq w \in L} \left| \frac{1}{(z-w)^2} - \frac{1}{w^2} \right| < \infty$$

לכן $\beta(z; L) \sim \frac{1}{z^2}$ (כאשר $z \rightarrow 0$)

$$\beta(z; L) \sim \frac{1}{z^2}$$

לכן $\beta(z; L) \sim \frac{1}{z^2}$ (כאשר $z \rightarrow 0$)

$$\beta' = \frac{-2}{z^3} + \sum_{0 \neq w \in L} \frac{-2}{(z-w)^3} = -2 \sum_{w \in L} \frac{1}{(z-w)^3} = -2 \beta_3(z)$$

$$\beta'(z+w_0) - \beta'(z) = 0$$

Week: 21 12-15-10

$$f(z + \omega_0) - f(z) = c(\omega_0)$$

$\sqrt{2} \rho, \tau = \frac{\omega_0}{2}$ (3) $\rho_1, \rho_2, \dots, \rho_n = f(\tau) = 0$ $\rho_1, \rho_2, \dots, \rho_n$

$$f\left(-\frac{\omega_0}{2} + \omega_0\right) - f\left(-\frac{\omega_0}{2}\right) = C(\omega_0)$$

$$\cancel{2\pi(\omega_0)} \quad g(-\frac{\omega_0}{2}) = g(\frac{\omega_0}{2}) = C(\omega_0)$$

$$\Rightarrow C(\omega_0) = 0$$

הבואה לה' ביום הזה

אז אונזער אה'ער און קדושה תימים זאל קעגן

12 f دریا - 1/2 - 6 208 - 2

1310' n 10' n 1' n 1' n 1' n 1' n 1' n 1' n 1' n 1' n

$$\frac{1}{2\pi i} \oint_{\partial D} f(z) dz = 0 \quad \text{by (4)}$$

$$\sum_{p \in E} R_{pi} f = 0, \text{ gen. Netz (5)}$$

$$\sum_{f(1)=0} z_i - \sum_{f(1)=1} z_j \in L \quad \Rightarrow \quad \frac{\sum z_i}{\sum z_j} \notin \mathbb{Q}$$

$\gamma(f) = 2 - e$ و $\gamma(g) = 2$ و $\gamma(h) = 3$ و $\gamma(i) = 2$

2012P 151 -60'A P Lr

מבוא: המסמך מפרט את תוכנית הלימודים לתואר ראשון בחינוך.

ה'תש"ח - 1947 - 1948 - 1949 - 1950 - 1951 - 1952 - 1953 - 1954 - 1955 - 1956 - 1957 - 1958 - 1959 - 1960 - 1961 - 1962 - 1963 - 1964 - 1965 - 1966 - 1967 - 1968 - 1969 - 1970 - 1971 - 1972 - 1973 - 1974 - 1975 - 1976 - 1977 - 1978 - 1979 - 1980 - 1981 - 1982 - 1983 - 1984 - 1985 - 1986 - 1987 - 1988 - 1989 - 1990 - 1991 - 1992 - 1993 - 1994 - 1995 - 1996 - 1997 - 1998 - 1999 - 2000 - 2001 - 2002 - 2003 - 2004 - 2005 - 2006 - 2007 - 2008 - 2009 - 2010 - 2011 - 2012 - 2013 - 2014 - 2015 - 2016 - 2017 - 2018 - 2019 - 2020 - 2021 - 2022 - 2023 - 2024 - 2025 - 2026 - 2027 - 2028 - 2029 - 2030 - 2031 - 2032 - 2033 - 2034 - 2035 - 2036 - 2037 - 2038 - 2039 - 2040 - 2041 - 2042 - 2043 - 2044 - 2045 - 2046 - 2047 - 2048 - 2049 - 2050 - 2051 - 2052 - 2053 - 2054 - 2055 - 2056 - 2057 - 2058 - 2059 - 2060 - 2061 - 2062 - 2063 - 2064 - 2065 - 2066 - 2067 - 2068 - 2069 - 2070 - 2071 - 2072 - 2073 - 2074 - 2075 - 2076 - 2077 - 2078 - 2079 - 2080 - 2081 - 2082 - 2083 - 2084 - 2085 - 2086 - 2087 - 2088 - 2089 - 2090 - 2091 - 2092 - 2093 - 2094 - 2095 - 2096 - 2097 - 2098 - 2099 - 2100 - 2101 - 2102 - 2103 - 2104 - 2105 - 2106 - 2107 - 2108 - 2109 - 2110 - 2111 - 2112 - 2113 - 2114 - 2115 - 2116 - 2117 - 2118 - 2119 - 2120 - 2121 - 2122 - 2123 - 2124 - 2125 - 2126 - 2127 - 2128 - 2129 - 2130 - 2131 - 2132 - 2133 - 2134 - 2135 - 2136 - 2137 - 2138 - 2139 - 2140 - 2141 - 2142 - 2143 - 2144 - 2145 - 2146 - 2147 - 2148 - 2149 - 2150 - 2151 - 2152 - 2153 - 2154 - 2155 - 2156 - 2157 - 2158 - 2159 - 2160 - 2161 - 2162 - 2163 - 2164 - 2165 - 2166 - 2167 - 2168 - 2169 - 2170 - 2171 - 2172 - 2173 - 2174 - 2175 - 2176 - 2177 - 2178 - 2179 - 2180 - 2181 - 2182 - 2183 - 2184 - 2185 - 2186 - 2187 - 2188 - 2189 - 2190 - 2191 - 2192 - 2193 - 2194 - 2195 - 2196 - 2197 - 2198 - 2199 - 2200 - 2201 - 2202 - 2203 - 2204 - 2205 - 2206 - 2207 - 2208 - 2209 - 2210 - 2211 - 2212 - 2213 - 2214 - 2215 - 2216 - 2217 - 2218 - 2219 - 2220 - 2221 - 2222 - 2223 - 2224 - 2225 - 2226 - 2227 - 2228 - 2229 - 2230 - 2231 - 2232 - 2233 - 2234 - 2235 - 2236 - 2237 - 2238 - 2239 - 2240 - 2241 - 2242 - 2243 - 2244 - 2245 - 2246 - 2247 - 2248 - 2249 - 2250 - 2251 - 2252 - 2253 - 2254 - 2255 - 2256 - 2257 - 2258 - 2259 - 2260 - 2261 - 2262 - 2263 - 2264 - 2265 - 2266 - 2267 - 2268 - 2269 - 2270 - 2271 - 2272 - 2273 - 2274 - 2275 - 2276 - 2277 - 2278 - 2279 - 2280 - 2281 - 2282 - 2283 - 2284 - 2285 - 2286 - 2287 - 2288 - 2289 - 2290 - 2291 - 2292 - 2293 - 2294 - 2295 - 2296 - 2297 - 2298 - 2299 - 2300 - 2301 - 2302 - 2303 - 2304 - 2305 - 2306 - 2307 - 2308 - 2309 - 2310 - 2311 - 2312 - 2313 - 2314 - 2315 - 2316 - 2317 - 2318 - 2319 - 2320 - 2321 - 2322 - 2323 - 2324 - 2325 - 2326 - 2327 - 2328 - 2329 - 2330 - 2331 - 2332 - 2333 - 2334 - 2335 - 2336 - 2337 - 2338 - 2339 - 2340 - 2341 - 2342 - 2343 - 2344 - 2345 - 2346 - 2347 - 2348 - 2349 - 2350 - 2351 - 2352 - 2353 - 2354 - 2355 - 2356 - 2357 - 2358 - 2359 - 2360 - 2361 - 2362 - 2363 - 2364 - 2365 - 2366 - 2367 - 2368 - 2369 - 2370 - 2371 - 2372 - 2373 - 2374 - 2375 - 2376 - 2377 - 2378 - 2379 - 2380 - 2381 - 2382 - 2383 - 2384 - 2385 - 2386 - 2387 - 2388 - 2389 - 2390 - 2391 - 2392 - 2393 - 2394 - 2395 - 2396 - 2397 - 2398 - 2399 - 2400 - 2401 - 2402 - 2403 - 2404 - 2405 - 2406 - 2407 - 2408 - 2409 - 2410 - 2411 - 2412 - 2413 - 2414 - 2415 - 2416 - 2417 - 2418 - 2419 - 2420 - 2421 - 2422 - 2423 - 2424 - 2425 - 2426 - 2427 - 2428 - 2429 - 2430 - 2431 - 2432 - 2433 - 2434 - 2435 - 2436 - 2437 - 2438 - 2439 - 2440 - 2441 - 2442 - 2443 - 2444 - 2445 - 2446 - 2447 - 2448 - 2449 - 2450 - 2451 - 2452 - 2453 - 2454 - 2455 - 2456 - 2457 - 2458 - 2459 - 2460 - 2461 - 2462 - 2463 - 2464 - 2465 - 2466 - 2467 - 2468 - 2469 - 2470 - 2471 - 2472 - 2473 - 2474 - 2475 - 2476 - 2477 - 2478 - 2479 - 2480 - 2481 - 2482 - 2483 - 2484 - 2485 - 2486 - 2487 - 2488 - 2489 - 2490 - 2491 - 2492 - 2493 - 2494 - 2495 - 2496 - 2497 - 2498 - 2499 - 2500 - 2501 - 2502 - 2503 - 2504 - 2505 - 2506 - 2507 - 2508 - 2509 - 2510 - 2511 - 2512 - 2513 - 2514 - 2515 - 2516 - 2517 - 2518 - 2519 - 2520 - 2521 - 2522 - 2523 - 2524 - 2525 - 2526 - 2527 - 2528 - 2529 - 2530 - 2531 - 2532 - 2533 - 2534 - 2535 - 2536 - 2537 - 2538 - 2539 - 2540 - 2541 - 2542 - 2543 - 2544 - 2545 - 2546 - 2547 - 2548 - 2549 - 2550 - 2551 - 2552 - 2553 - 2554 - 2555 - 2556 - 2557 - 2558 - 2559 - 2560 - 2561 - 2562 - 2563 - 2564 - 2565 - 2566 - 2567 - 2568 - 2569 - 2570 - 2571 - 2572 - 2573 - 2574 - 2575 - 2576 - 2577 - 2578 - 2579 - 2580 - 2581 - 2582 - 2583 - 2584 - 2585 - 2586 - 2587 - 2588 - 2589 - 2590 - 2591 - 2592 - 2593 - 2594 - 2595 - 2596 - 2597 - 2598 - 2599 - 2600 - 2601 - 2602 - 2603 - 2604 - 2605 - 2606 - 2607 - 2608 - 2609 - 2610 - 2611 - 2612 - 2613 - 2614 - 2615 - 2616 - 2617 - 2618 - 2619 - 2620 - 2621 - 2622 - 2623 - 2624 - 2625 - 2626 - 2627 -

$$f = R(y) + y' \cdot S(y), \quad R, S \in \mathbb{C}(x)$$

$$(-25, 2, 8, 112)$$

פ' ה'תשנ"א

- Ex $G_{2n+1}(L) = 0$, für $G_n(L) = \sum_{0 \leq \omega \leq L} \frac{1}{\omega^n}$, $n \geq 2$ - f(G) $\frac{1}{5^{1/2}}$

$$G_{2n+1} = \sum_{\omega \in L} \frac{1}{\omega^{2n+1}} = \sum_{\omega \in L} \frac{1}{(-\omega')^{2n+1}} = - \sum_{\omega' \in L} \frac{1}{(\omega')^{2n+1}} = -G_{2n+1}$$

$$f(z; L) = \frac{1}{z^2} + \sum_{n=1}^{\infty} (2n+1) G_{2n+2}(L) z^{2n}, \quad 0 < |z| < 1$$

$$\frac{1}{(z-\omega)^2} - \frac{1}{\omega^2} = \frac{1}{\omega^2} \left[\frac{1}{(1-\frac{z}{\omega})^2} - 1 \right]$$

$$\frac{1}{(1-x)^2} = 1 + \sum_{n=1}^{\infty} (n+1) x^n, \quad |x| < 1$$

$$\frac{1}{(z-\omega)^2} - \frac{1}{\omega^2} = \frac{1}{\omega^2} \cdot \sum_{n=1}^{\infty} (n+1) \left(\frac{z}{\omega}\right)^n$$

$$f(z) = \frac{1}{z^2} + \sum_{\omega \neq 0} \left(\frac{1}{(z-\omega)^2} - \frac{1}{\omega^2} \right) = \frac{1}{z^2} + \sum_{\omega \neq 0} \frac{1}{\omega^2} \cdot \sum_{n=1}^{\infty} (n+1) \left(\frac{z}{\omega}\right)^n =$$

$$= \frac{1}{z^2} + \sum_{n=1}^{\infty} (n+1) \left[\sum_{\omega \neq 0} \frac{1}{\omega^{n+2}} \right] \cdot z^n$$

□

המשוואה הדיפרנציאלית

$$y'' = 4y^3 - g_2 y - g_3, \quad y_2(L) = 140G_6(L), \quad y_3(L) = 60G_4(L)$$

$$(y')^2 = 4y^3 - g_2 y - g_3$$

$$y = \frac{1}{z^2} + 3G_4 z^2 + 5G_6 z^4 + O(z^6)$$

$$y' = -\frac{2}{z^3} + 6G_4 z + 20G_6 z^3 + O(z^5)$$

$$y'^2 = \frac{4}{z^6} + 2 \cdot \frac{-2}{z^3} 6G_4 z + 2 \cdot \frac{-2}{z^3} 20G_6 z^3 + O(z^2) =$$

$$= \frac{4}{z^6} - 24G_4 \frac{1}{z^2} - 80G_6 + O(z^2)$$

$$- \text{הוא} \quad \frac{1}{z^6} \quad \text{הוא} \quad -60G_4 \quad \text{הוא} \quad 4y^3$$

$$(y')^2 - 4y^3 = -60G_4 \cdot \frac{1}{z^2} - 140G_6 + O(z^2) = -g_2 \frac{1}{z^2} - g_3 + O(z^2)$$

$$(y)^3 = \frac{1}{z^6} \left(1 + 3G_4 z^4 + 5G_6 z^6 + \dots \right)^3 =$$

$$= \frac{1}{z^6} \left(1 + 3 \cdot 1^2 \cdot 3G_4 z^4 + 3 \cdot 1^2 \cdot 5G_6 z^6 + O(z^8) \right) =$$

$$= \frac{1}{z^6} \left(G_4 \cdot \frac{1}{z^2} + 15G_6 + O(z^2) \right)$$

$$(p')^2 - 4p^3 + g_2 p = -g_2 \frac{1}{z^2} - g_3 - g_2 \left(\frac{1}{z^2} + 36z^2 + \dots \right)$$

$z = -21 \rightarrow 8127$ pr $-e'wz$ $wtwz$ $-l'lx$, $-w'a'x$ $n'3y'w$
 D $o'x$ $-wz$ pr , wt $-b'v$

הנהגת ה"מ"ח"ר פ"ד ע"ב

בצורה פנימית

נחמד. הנה שאלה E_2 ב-3. הנה שאלה -

1. (10 points) Let $f(x) = x^2 + 2x + 1$. Find $f'(x)$.

סו נשטח, ופער ארבעט א קעגן - צו 1
מין גאלד היינט אלץ:

$\varphi: \mathbb{R}^3 \rightarrow \mathbb{R}^3, (x, y, z) \mapsto (x, y, z)$

$\therefore P' \sim P'$ ρ' $\mathbb{R}$

- 28

$$\varphi(-z) = (x, y)$$

נצ"ו, פ' ה"ל מ' ע"ה

$$(f(z_1), f'(z_1)) = \varphi(z_1) \stackrel{?}{=} \varphi(z_2) = (f(z_2), f'(z_2))$$

$\rightarrow$

$$f'(z_1) = f'(z_2)$$

[illegible]

$\phi_1: \mathbb{R}^2 \rightarrow \mathbb{R}^2, \phi_1(x, y) = (x, y)$ $\phi_2: \mathbb{R}^2 \rightarrow \mathbb{R}^2, \phi_2(x, y) = (x, -y)$

$$\psi(z_2) = (p(z_2), p'(z_2)) = (p(z_1), -p'(z_1)) = (x, -y) \neq (x, y)$$

(! $y \neq 0$ ρ)

? $p' = 0$ in

$$1. \text{pl} \cdot 2\text{pl} \text{ gl } 22\text{GL} \Leftrightarrow \text{pl} \cdot 2\text{pl} \cdot 2\text{pl} \text{ gl } 22\text{GL}$$

$$p'(\frac{\omega}{2}) = p'(-\frac{\omega}{2} + \omega) = p'(-\omega/2) = -p'(\omega/2)$$

$e' = 511, w/2 = L, p = 0, k/h = 0, w/2 \rightarrow p' = 0 - 0 \quad r/2 \quad \text{or } \frac{1}{2}$

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1-1 2 13191 G20, 1-1 1 102, 11 4: $\mathbb{C}/\mathbb{Z} \rightarrow \mathbb{E}U_{3003}$: 6000
 $\mathbb{Z}=0-2$ 11 11/12 13191 3) $\frac{1}{2}\mathbb{Z}/\mathbb{Z}=\mathbb{Z}_2$ 11 11/12 11 11/12

Prok and nager ne

חלק החבורה של E

$\therefore K, P_1, P_2 \in E$ זהו "ו"

$$E = \{y^2 = 4x^3 - g_2x - g_3\}$$

המשפט

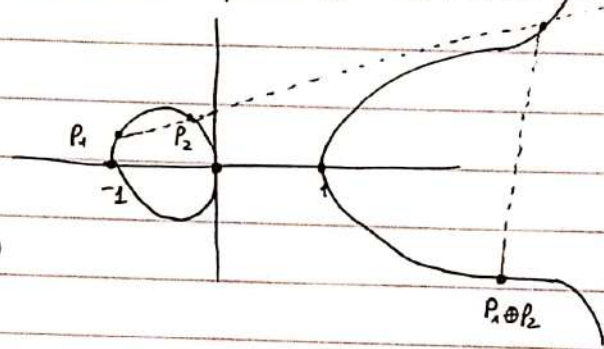
$$P_1 = \varphi(z_1), P_2 = \varphi(z_2), \quad z_i \in \mathbb{C}/L$$

המשפט 2.3.2

$$P_1 \oplus P_2 = \varphi(z_1 + z_2) \in E$$

המשפט 2.3.2

$$4y^2 = x^3 - x = x(x-1)(x+1), \quad \text{לפי 2.3.1}$$



המשפט 2.3.2
המשפט 2.3.2
המשפט 2.3.2
המשפט 2.3.2
המשפט 2.3.2

$$-P = (x, -y) \quad \text{ול} \quad P = (x, y) \quad \text{אל } \textcircled{1} \text{ : המשפט}$$

$$\text{ול} \quad \textcircled{2} \quad -\varphi(z_1 + z_2) = \varphi(z_1) \oplus \varphi(z_2) \quad \text{ול} \quad \textcircled{3}$$

$$\text{ול} \quad \textcircled{3} \quad \varphi(0) = O_E \quad \text{ול} \quad \textcircled{3}$$

המשפט 2.3.2

$$P_1 = \varphi(z_1) = (x_1, y_1) \quad \text{ול} \quad -P_2 = (x_2, -y_2) \quad \text{ול} \quad \textcircled{1}$$

$$P_2 = \varphi(z_2) = (x_2, y_2)$$

$$P_1 \oplus P_2 = (x_3, y_3) \quad \text{ול}$$

$$-x_3 = x_1 + x_2 + \frac{1}{4} \left(\frac{y_1 - y_2}{x_1 - x_2} \right)^2$$

$$-y_3 = y_1 + (x_3 - x_1) \frac{y_1 - y_2}{x_1 - x_2}$$