b) $f'(1)=\lim\limits_{\Delta x\to 0}\dfrac{\sqrt[5]{1+\Delta x}-1}{\Delta x}=\lim\limits_{\Delta x\to 0}\dfrac{1}{\sqrt[5]{(\Delta x)^4}}=\infty$; c) $f'-\left(\dfrac{2k+1}{2}\pi\right)=$

$=\lim\limits_{\Delta x\to -0}\dfrac{\left|\cos\left(\dfrac{2k+1}{2}\pi+\Delta x\right)\right|}{\Delta x}=\lim\limits_{\Delta x\to -0}\dfrac{|\sin\Delta x|}{\Delta x}=-1;\quad f'+\left(\dfrac{2k+1}{2}\pi\right)=$

$=\lim\limits_{\Delta x\to +0}\dfrac{|\sin\Delta x|}{\Delta x}=1$. 368. $5x^4-12x^2+2$. 369. $-\dfrac{1}{3}+2x-2x^3$. 370. $2ax+b$.

371. $-\dfrac{15x^2}{a}$. 372. $mat^{m-1}+b(m+n)t^{m+n-1}$. 373. $\dfrac{6ax^5}{\sqrt{a^2+b^2}}$. 374. $-\dfrac{\pi}{x^2}$.

375. $2x^{-\frac{1}{3}}-5x^{\frac{3}{2}}-3x^{-4}$. 376. $\dfrac{8}{3}x^{\frac{5}{3}}$. **Hint.** $y=x^2x^{\frac{2}{3}}=x^{\frac{8}{3}}$. 377. $\dfrac{4b}{3x^2\sqrt[3]{x}}-$

$-\dfrac{2a}{3x\sqrt[3]{x^2}}$. 378. $\dfrac{bc-ad}{(c+dx)^2}$. 379. $\dfrac{-2x^2-6x+25}{(x^2-5x+5)^2}$. 380. $\dfrac{1-4x}{x^2(2x-1)^2}$.

381. $\dfrac{1}{\sqrt{z}(1-\sqrt{z})^2}$. 382. $5\cos x-3\sin x$. 383. $\dfrac{4}{\sin^2 2x}$. 384. $\dfrac{-2}{(\sin x-\cos x)^2}$.

385. $t^2\sin t$. 386. $y'=0$. 387. $\cot x-\dfrac{x}{\sin^2 x}$. 388. $\arcsin x+\dfrac{x}{\sqrt{1-x^2}}$.

389. $x\arctan x$. 390. $x^6e^x(x+7)$. 391. xe^x. 392. $e^x\dfrac{x-2}{x^3}$. 393. $\dfrac{5x^4-x^5}{e^x}$.

394. $e^x(\cos x-\sin x)$. 395. x^2e^x. 396. $e^x\left(\arcsin x+\dfrac{1}{\sqrt{1-x^2}}\right)$. 397. $\dfrac{x(2\ln x-1)}{\ln^2 x}$.

398. $3x^2\ln x$. 399. $\dfrac{2}{x}+\dfrac{\ln x}{x^2}-\dfrac{2}{x^2}$. 400. $\dfrac{2\ln x}{x\ln 10}-\dfrac{1}{x}$. 401. $\sinh x+x\cosh x$.

402. $\dfrac{2x\cosh x-x^2\sinh x}{\cosh^2 x}$. 403. $-\tanh^2 x$. 404. $\dfrac{-3(x\ln x+\sinh x\cosh x)}{x\ln^2 x\cdot\sinh^2 x}$.

405. $\dfrac{-2x^2}{1-x^4}$. 406. $\dfrac{1}{\sqrt{1-x^2}}\operatorname{arc\,sinh} x+\dfrac{1}{\sqrt{1+x^2}}\arcsin x$.

407. $\dfrac{x-\sqrt{x^2-1}\operatorname{arc\,cosh} x}{x^2\sqrt{x^2-1}}$. 408. $\dfrac{1+2x\operatorname{arc\,tanh} x}{(1-x^2)^2}$. 410. $\dfrac{3a}{c}\left(\dfrac{ax+b}{c}\right)^2$.

411. $12ab+18b^2y$. 412. $16x(3+2x^2)^3$. 413. $\dfrac{x^2-1}{(2x-1)^3}$. 414. $\dfrac{-x}{\sqrt{1-x^2}}$.

415. $\dfrac{bx^2}{\sqrt[3]{(a+bx^3)^2}}$. 416. $-\sqrt{\sqrt[3]{\dfrac{a^2}{x^2}}-1}$. 418. $\dfrac{1-\tan^2 x+\tan^4 x}{\cos^2 x}$.

419. $\dfrac{-1}{2\sin^2 x\sqrt{\cot x}}$. 420. $2-15\cos^2 x\sin x$. 421. $\dfrac{-16\cos 2t}{\sin^3 2t}$. **Hint.** $x=\sin^{-2}t+$

$+\cos^{-2}t$. 422. $\dfrac{\sin x}{(1-3\cos x)^3}$. 423. $\dfrac{\sin^3 x}{\cos^4 x}$. 424. $\dfrac{3\cos x+2\sin x}{2\sqrt{15\sin x-10\cos x}}$.

425. $\dfrac{2\cos x}{3\sqrt[3]{\sin x}}+\dfrac{3\sin x}{\cos^4 x}$. 426. $\dfrac{1}{2\sqrt{1-x^2}\sqrt{1+\arcsin x}}$.

427. $\dfrac{1}{2(1+x^2)\sqrt{\arctan x}}-\dfrac{3(\arcsin x)^2}{\sqrt{1-x^2}}$. 428. $\dfrac{-1}{(1+x^2)(\arctan x)^2}$.

429. $\frac{e^x+xe^x+1}{2\sqrt{xe^x+x}}$. 430. $\frac{2e^x-2^x\ln 2}{3\sqrt[3]{(2e^x-2^x+1)^2}}+\frac{5\ln^4 x}{x}$. 432. $(2x-5)\times$
$\times\cos(x^5-5x+1)-\frac{a}{x^2\cos^2\frac{a}{x}}$. 433. $-\alpha\sin(\alpha x+\beta)$. 434. $\sin(2t+\varphi)$.
435. $-2\frac{\cos x}{\sin^3 x}$. 436. $\frac{-1}{\sin^2\frac{x}{a}}$. 437. $x\cos 2x^2\sin 3x^3$. 438. **Solution.**
$\frac{1}{\sqrt{1-(2x)^2}}(2x)'=\frac{2}{\sqrt{1-4x^2}}$. 439. $\frac{-2}{x\sqrt{x^4-1}}$. 440. $\frac{-1}{2\sqrt{x-x^2}}$. 441. $\frac{-1}{1+x^2}$.
442. $\frac{-1}{1+x^2}$. 443. $-10xe^{-x^2}$. 444. $-2x5^{-x^2}\ln 5$. 445. $2x10^{2x}(1+x\ln 10)$.
446. $\sin 2^t+2^t t\cos 2^t\ln 2$. 447. $\frac{-e^x}{\sqrt{1-e^{2x}}}$. 448. $\frac{2}{2x+7}$. 449. $\cot x\log e$.
450. $\frac{-2x}{1-x^2}$. 451. $\frac{2\ln x}{x}-\frac{1}{x\ln x}$. 452. $\frac{(e^x+5\cos x)\sqrt{1-x^2}-4}{(e^x+5\sin x-4\arcsin x)\sqrt{1-x^2}}$.
453. $\frac{1}{(1+\ln^2 x)x}+\frac{1}{(1+x^2)\arctan x}$. 454. $\frac{1}{2x\sqrt{\ln x+1}}+\frac{1}{2(\sqrt{x}+x)}$.
455. **Solution.** $y'=(\sin^3 5x)'\cos^2\frac{x}{3}+\sin^3 5x\left(\cos^2\frac{x}{3}\right)'=3\sin^2 5x\cos 5x\,5\cos^2\frac{x}{3}+$
$+\sin^3 5x\,2\cos\frac{x}{3}\left(-\sin\frac{x}{3}\right)\frac{1}{3}=15\sin^2 5x\cos 5x\cos^2\frac{x}{3}-\frac{2}{3}\sin^3 5x\cos\frac{x}{3}\sin\frac{x}{3}$.
456. $\frac{4x+3}{(x-2)^3}$ 457. $\frac{x^2+4x-6}{(x-3)^5}$. 458. $\frac{x^7}{(1-x^2)^5}$. 459. $\frac{x-1}{x^2\sqrt{2x^2-2x+1}}$.
460. $\frac{1}{\sqrt{(a^2+x^2)^3}}$. 461. $\frac{x^2}{\sqrt{(1+x^2)^5}}$. 462. $\frac{(1+\sqrt{x})^3}{\sqrt[3]{x}}$. 463. $x^5\sqrt[3]{(1+x^3)^2}$.
464. $\frac{1}{\sqrt[4]{(x-1)^3(x+2)^5}}$. 465. $4x^3(a-2x^3)(a-5x^3)$.
466. $\frac{2abmnx^{n-1}(a+bx^n)^{m-1}}{(a-bx^n)^{m+1}}$. 467. $\frac{x^3-1}{(x+2)^6}$. 468. $\frac{a-3x}{2\sqrt{a-x}}$.
469. $\frac{3x^2+2(a+b+c)x+ab+bc+ac}{2\sqrt{(x+a)(x+b)(x+c)}}$. 470. $\frac{1+2\sqrt{y}}{6\sqrt{y}\sqrt[3]{(y+\sqrt{y})^2}}$.
471. $2(7t+4)\sqrt[3]{3t+2}$. 472. $\frac{y-a}{\sqrt{(2ay-y^2)^3}}$. 473. $\frac{1}{\sqrt{e^x+1}}$. 474. $\sin^3 x\cos^2 x$.
475. $\frac{1}{\sin^4 x\cos^4 x}$. 476. $10\tan 5x\sec^2 5x$. 477. $x\cos x^2$. 478. $3t^2\sin 2t^3$.
479. $3\cos x\cos 2x$. 480. $\tan^4 x$. 481. $\frac{\cos 2x}{\sin^4 x}$. 482. $\frac{(\alpha-\beta)\sin 2x}{2\sqrt{\alpha\sin^2 x+\beta\cos^2 x}}$. 483. 0.
484. $\frac{1}{2}\frac{\arcsin x(2\arccos x-\arcsin x)}{\sqrt{1-x^2}}$. 485. $\frac{2}{x\sqrt{2x^2-1}}$. 486. $\frac{1}{1+x^2}$.
487. $\frac{x\arccos x-\sqrt{1-x^2}}{(1-x^2)^{3/2}}$. 488. $\frac{1}{\sqrt{a-bx^2}}$. 489. $\sqrt{\frac{a-x}{a+x}}$. 490. $2\sqrt{a^2-x^2}$.
491. $\frac{-x}{\sqrt{2x-x^2}}$. 492. $\arcsin\sqrt{x}$. 493. $\frac{5}{\sqrt{1-25x^2}\arcsin 5x}$.

494. $\frac{1}{x\sqrt{1-\ln^2 x}}$. 495. $\frac{\sin\alpha}{1-2x\cos a+x^2}$. 496. $\frac{1}{5+4\sin x}$.
497. $4x\sqrt{\frac{x}{b-x}}$. 498. $\frac{\sin^2 x}{1+\cos^2 x}$. 499. $\frac{a}{2}\sqrt{e^{ax}}$. 500. $\sin 2xe^{\sin^2 x}$.
501. $2m^2p\,(2ma^{mx}+b)^{p-1}a^{mx}\ln a$. 502. $e^{at}(\alpha\cos\beta t-\beta\sin\beta t)$. 503. $e^{ax}\sin\beta x$.
504. $e^{-x}\cos 3x$. 505. $x^{n-1}a^{-x^2}(n-2x^2\ln a)$. 506. $-\frac{1}{2}y\tan x\,(1+\sqrt{\cos x}\ln a)$.
507. $\frac{3\cot\frac{1}{x}\ln 3}{\left(x\sin\frac{1}{x}\right)^2}$. 508. $\frac{2ax+b}{ax^2+bx+c}$. 509. $\frac{1}{\sqrt{a^2+x^2}}$. 510. $\frac{\sqrt{x}}{1+\sqrt{x}}$.
511. $\frac{1}{\sqrt{2ax+x^2}}$. 512. $\frac{-2}{x\ln^3 x}$. 513. $-\frac{1}{x^2}\tan\frac{x-1}{x}$. 514. $\frac{2x+11}{x^2-x-2}$. **Hint.** $y=5\ln(x-2)-3\ln(x+1)$. 515. $\frac{3x^2-16x+19}{(x-1)(x-2)(x-3)}$. 516. $\frac{1}{\sin^2 x\cos x}$.
517. $\sqrt{x^2-a^2}$. 518. $\frac{-6x^2}{(3-2x^3)\ln(3-2x^3)}$. 519. $\frac{15a\ln^2(ax+b)}{ax+b}$.
520. $\frac{2}{\sqrt{x^2+a^2}}$. 521. $\frac{mx+n}{x^2-a^2}$. 522. $\sqrt{2}\sin\ln x$. 523. $\frac{1}{\sin^3 x}$.
524. $\frac{\sqrt{1+x^2}}{x}$. 525. $\frac{x+1}{x^3-1}$. 526. $\frac{3}{\sqrt{1-9x^2}}[2^{\arcsin 3x}\ln 2+2(1-\arccos 3x)]$.
527. $\left(3^{\cos bx}\ln 3+\frac{\sin^2 ax}{\cos^2 bx}\right)\frac{a\cos ax\cos bx+b\sin ax\sin bx}{\cos^2 bx}$. 528. $\frac{1}{1+2\sin x}$.
529. $\frac{1}{x(1+\ln^2 x)}$. 530. $\frac{1}{\sqrt{1-x^2}\arcsin x}+\frac{\ln x}{x}+\frac{1}{x\sqrt{1-\ln^2 x}}$.
531. $-\frac{1}{x(1+\ln^2 x)}$. 532. $\frac{x^2}{x^4+x^2-2}$. 533. $\frac{2}{\cos x\sqrt{\sin x}}$. 534. $\frac{x^2-3x}{x^4-1}$.
535. $\frac{1}{1+x^3}$. 536. $\frac{\arcsin x}{(1-x^2)^{3/2}}$. 537. $6\sinh^2 2x\cdot\cosh 2x$. 538. $e^{ax}(\alpha\cosh\beta x+$
$+\beta\sinh\beta x)$. 539. $6\tanh^2 2x\,(1-\tanh^2 2x)$ 540. $2\coth 2x$. 541. $\frac{2x}{\sqrt{a^4+x^4}}$.
542. $\frac{1}{x\sqrt{\ln^2 x-1}}$ 543. $\frac{1}{\cos 2x}$. 544. $\frac{-1}{\sin x}$. 545. $\frac{2}{1-x^2}$. 546. $x\operatorname{arc}\tanh x$
547. $x\operatorname{arc}\sinh x$. 548. a) $y'=1$ when $x>0$; $y'=-1$ when $x<0$; $y'(0)$ does not exist; b) $y'=|2x|$. 549. $y'=\frac{1}{x}$. 550. $f'(x)=\begin{cases}-1 \text{ when } x\leqslant 0,\\ -e^{-x} \text{ when } x>0.\end{cases}$
552. $\frac{1}{2}+\frac{\sqrt{3}}{3}$. 553. 6π. 554. a) $f'_-(0)=-1$, $f'_+(0)=1$; b) $f'_-(0)=\frac{2}{a}$, $f'_+(0)=\frac{-2}{a}$; c) $f'_-(0)=1$, $f'_+(0)=0$; d) $f'_-(0)=f'_+(0)=0$, e) $f'_-(0)$ and $f'_+(0)$ do not exist. 555. $1-x$. 556. $2+\frac{x-3}{4}$. 557. -1. 558. 0 561. **Solution.** We have $y'=e^{-x}(1-x)$. Since $e^{-x}=\frac{y}{x}$, it follows that $y'=\frac{y}{x}(1-x)$ or $xy'=y(1-x)$ 566. $(1+2x)(1+3x)+2(1+x)(1+3x)+3(x+1)(1+2x)$.
567. $-\frac{(x+2)(5x^2+19x+20)}{(x+1)^4(x+3)^5}$. 568. $\frac{x^2-4x+2}{2\sqrt{x(x-1)(x-2)^3}}$