O‘ZBEKISTON RESPUBLIKASI OLIY VA O‘RTA MAXSUS TA’LIM VAZIRLIGI

TOSHKENT MOLIYA INSTITUTI

«МАТЕМАТИКА» КАФЕДРАСИ

«OLIY MATEMATIKA» FANIDAN

Amaliy mashg‘ulot

TUZUVCHILAR: Dots.Muminova R., katta o‘qit. Turdaxunova S.

Toshkent- 2010

28. TO'LA DIFFERENSIALGA DOIR MISOLLAR YECHISH

Ikki, uch va undan ko'p o'zgaruvchiga bog'liq bo'lgan funksiyalar *ko'p o'zgaruvchiga bog'liq funksiyalar* deyiladi va

z=f(x;y)

u=f(x;y;z) ...

v=f(x;y;z; ….;t)

kabi yoziladi. Ko'p o'zgaruvchiga bog'liq funksialardan bir o'zgaruvchisi bo'yicha xususiy hosila hisoblaganda boshqa o'zgaruvchilari o'zgarmas deb qaraladi. *Ko'p o'zgaruvchiga bog'liq funksiyaning to'la differensiali* quyidagi formula bo'yicha topiladi:

z=f(x,y) funksiya uchun

$$dz = \frac{\partial f}{\partial x}dx + \frac{\partial f}{\partial y}dy$$

u=f(x,y,z) funksiya uchun

$$du = \frac{\partial f}{\partial x}dx + \frac{\partial f}{\partial y}dy + \frac{\partial f}{\partial z}dz$$

28.1. $z(x,y) = y\sqrt{x} + \frac{x}{\sqrt{y}}$ funksiya xususiy hosilalarini toping. *z(x,y)* funksiyadan *x* bo'yicha xususiy hosilani hisoblaganda o'zgaruvchi *y* ni o'zgarmas son deb qaraymiz:

$$\frac{\partial z}{\partial x} = \frac{1}{2\sqrt{x}}y + \frac{1}{\sqrt{y}};$$

z(x,y) funksiyadan o'zgaruvchi *y* bo'yicha xususiy hosilani hisoblaganda o'zgaruvchi *x* ni o'zgarmas son deb qaraymiz:

$$\frac{\partial z}{\partial y} = \sqrt{x} - \frac{x}{2y \bullet \sqrt{y}}$$

28.2. *z(x,y)*= $\ln(x + \sqrt{x^2 + y^2})$ funksiyaning to'la differensialini toping:

$$dz = \frac{\partial z}{\partial x}dx + \frac{\partial z}{\partial y}dy$$

$$\frac{\partial z}{\partial x}=\frac{\left(x+\sqrt{x^2+y^2}\right)'_x}{x+\sqrt{x^2+y^2}}=\frac{1+\frac{\left(x^2+y^2\right)'_x}{2\sqrt{x^2+y^2}}}{x+\sqrt{x^2+y^2}}=\frac{1+\frac{x}{\sqrt{x^2+y^2}}}{x+\sqrt{x^2+y^2}}=\frac{1}{\sqrt{x^2+y^2}};$$

$$\frac{\partial z}{\partial x}=\frac{\left(x+\sqrt{x^2+y^2}\right)'_y}{x+\sqrt{x^2+y^2}}=\frac{\frac{2y}{2\sqrt{x^2+y^2}}}{x+\sqrt{x^2+y^2}}=\frac{y}{\sqrt{x^2+y^2}\left(x+\sqrt{x^2+y^2}\right)};$$

$$dz=\frac{dx}{\sqrt{x^2+y^2}}+\frac{dz}{\sqrt{x^2+y^2}\left(x+\sqrt{x^2+y^2}\right)};$$

Mustaqil yechish uchun misollar

Quyidagi funksiyalarning xususiy hosilalarini toping:

28.3. $z(x,y)=\frac{x-y}{x+y}$ 28.4. $u=e^{\frac{x}{y}}+e^{\frac{z}{y}}$

28.5. $z(x,y)=-\frac{Cosx}{Cosy}$ 28.6. $z(x,y)=ln(x^2-y^2)$;

28.7. $z(x,y)=x\,Sin(x+y)$; 28.8. $z(x,y)=\frac{x}{\sqrt{x^2+y^2}}$

28.9. $z(x,y)=arcsin\frac{y}{x}$ 28.10. $u=2y\sqrt{x}+3y^2\sqrt[3]{z^2};$

28.11. $z(x,y)=\sqrt{xy+\frac{x}{y}}$ 28.12. $z(x,y)=e^{\sin\frac{y}{x}}$;

Quyidagi funksiyalarning to‘la differensiallarini toping:

28.13. $z=5x^3y^2;$ 28.14. $z=\frac{y}{x}-\frac{x}{y};$

28.15. $z=(\sin x)^{\cos y};$ 28.16. $z=e^{x^2+y^2};$

28.17. $z=arctg\frac{x}{y};$ 28.18. $z=sin^2x+cos^2y;$

28.19. $z=x\,ln\frac{y}{x};$ 28.20 . $z=x^y;$

28.21. $z=tg\frac{y}{x}+ctg\frac{x}{y};$ 28.22. $z=tg\left(2x+\sqrt{y}\right);$

28.23. $z=e^{xy}.$

28.24. $z=\sqrt{x}\,sin\frac{y}{x}$; $x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}=\frac{z}{2}$ ekani isbot qilinsin.

28.25. $z=ln(\sqrt{x}+\sqrt{y})$; $x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}=\frac{1}{2}$ ekani isbot qilinsin.

Quyidagi funksiyalarning xususiy hosilalarini toping:

28.26. $z=cos(ax-by)$;

28.27. $z=\frac{x}{3y-2x}$;

28.28. $z=\ln sin(x-2y)$;

28.29. $z=2cos^2\left(x-\frac{y}{2}\right)$;

28.30. $z=\ln tg\frac{y}{x}$;

28.31. $z=arctg\sqrt{xy}$;

28.32. $z=y\,e^{\frac{x}{y}}$;

28.33. u=(x-y) (x-z) (y-z).

Quyidagi funksiyalarning to‘la differensialini toping:

28.34. $z=x^m y^n$;

28.35. $z=y\sqrt[3]{x}$;

28.36. $z=\sqrt{x^2+y^2}$;

28.37. $z=e^{\cos(xy)}$;

28.38. $z=\frac{x}{y}e^{xy}$;

28.39. $u=x^{y^2 z}$.