

2. (1) $[0, 4]$ (2) $12\sqrt{1.2} - 10$ (3) $3\sqrt{x_0}$ (4) $3.3\sqrt{2}, 3\sqrt{3}$

3. -20

4. 略

5. (1) $y' = 4x^3$ (2) $y' = \frac{1}{3\sqrt{x}}$

(3) $y' = \frac{16}{5}x^2\sqrt{x}$ (4) $y' = -\frac{1}{6x\sqrt{x}}$

6. $x - 4y + 4 = 0, 4x + y - 18 = 0$

7. $3x - 12y \pm 1 = 0$

8. (2, 4)

9. 12

10. (1) $-\frac{1}{2}$ (2) -1

11. 切线方程: $y - \frac{1}{2} = -\frac{\sqrt{3}}{2}(x - \frac{\pi}{3})$

即 $3\sqrt{3}x + 6y - 3 - \sqrt{3}\pi = 0$

法线方程: $y - \frac{1}{2} = \frac{2}{\sqrt{3}}(x - \frac{\pi}{3})$

即 $12x - 6\sqrt{3}y - 4\pi + 3\sqrt{3} = 0$

12. 切线方程: $x - 2y - 2 + 2\ln 2 = 0$

法线方程: $2x + y - \ln 2 + 4 = 0$

习题 2-2

1. (1) $y' = 3x^2 - 2x + 4$ (2) $y' = -20x^{-6} - 28x^{-5} + 2x^{-2}$

(3) $y' = 15x^2 - 2^x \ln 2 + 3e^x$ (4) $y' = 2\sec^2 x + \sec x \tan x$

(5) $y' = \frac{1}{x} - \frac{2}{x \ln 10} + \frac{3}{x \ln 2}$ (6) $y' = \cos 2x$

(7) $y' = x + 2x \ln x$ (8) $y' = 3e^x (\cos x - \sin x)$

(9) $y' = -42x - 2$ (10) $y' = \frac{x \cos x - \sin x}{x^2}$

(11) $y' = \frac{1 - \ln x}{x^2}$ (12) $y' = \frac{x^5 e^x - 2x e^x}{x^4}$

(13) $y' = -\frac{1}{x \ln^2 x}$ (14) $y' = \frac{2}{(1+x)^2}$

(15) $y' = \frac{-1-2x}{(1+x+x^2)^2}$

(16) $y' = 2x \ln x \cos x + x \cos x - x^2 \sin x \ln x$

(17) $y' = 2x2^x + x^2 2^x \ln 2$

(18) $y' = \frac{1 + \sin t + \cos t}{(1 + \cos t)^2}$

(19) $y' = \frac{-2 \csc x \cot x (1+x^2) - 4x \csc x}{(1+x^2)^2}$

(20) $y' = \frac{2x + 9x^2 \ln x + x^4 - 4x \ln x - 3x^2}{(3 \ln x + x^2)^2}$

(21) $y' = \frac{-1}{\sqrt{x}(\sqrt{x}-1)^2}$ (22) $y' = \frac{1+x+\ln x}{(1+x)^2}$

(23) $y' = 2x \arctan x + 1$

2. (1) $y' = \sin 2x + 2x \cos x^2$

(2) $y' = 2 \cos 2x \sin 2x + \cos 2^x + \cos 2^x \cdot 2^x \ln 2 \cdot \sin 2x$

(3) $y' = -\frac{\sec^2 x}{x^2}$ (4) $y' = -\frac{e^x \cos(e^x)}{x^2}$

(5) $y' = \frac{1}{x \ln x}$ (6) $y' = \frac{e^x}{1+e^{2x}}$

(7) $y' = 3 \sin^2 x \cos x \ln^5 x + \frac{5 \ln^4 x \cdot \sin^3 x}{x}$

(8) $y' = 5x^4 + 4x^3 + 6x^2 + 4x + 1$

(9) $y' = \frac{1}{\sqrt{x}(1-x)}$ (10) $y' = \frac{1}{2x} + \frac{1}{2x\sqrt{\ln x}}$

(11) $y' = \frac{2}{a} \sec^2 \frac{x}{a} \tan \frac{x}{a} - \frac{2}{a} \csc^2 \frac{x}{a} \cot \frac{x}{a}$

(12) $y' = 8(2x+5)^3$ (13) $y' = 3 \sin(4-3x)$

(14) $y' = \frac{2 \cos \ln(x^2)}{x}$ (15) $y' = \frac{2x}{1+x^2}$

(16) $y' = \frac{1}{1+x^2}$ (17) $y' = \frac{x}{\sqrt{a^2-x^2}}$

$$(18) y' = \frac{2\arcsin x}{\sqrt{1-x^2}}$$

$$3. (1) y' = \frac{1}{\sqrt{x^2+1}}$$

$$(2) y' = -\frac{2}{1+x^2}$$

$$(3) y' = \frac{\sqrt{x^2-a^2}}{x}$$

$$(4) y' = \frac{1}{x^2} \sin \frac{2}{x} e^{-\sin^2 \frac{1}{x}}$$

$$(5) y' = \frac{1}{(2+2x+x^2) \arctan \frac{1}{1+x}}$$

$$(6) y' = -\frac{\csc^2 \frac{x}{2}}{4\sqrt{\cot \frac{x}{2}}}$$

$$(7) y' = (1+x^2)^{-\frac{3}{2}}$$

$$(8) y' = \operatorname{arccot} x$$

$$(9) y' = -\ln x \sin x + \frac{\cos x}{x} - \frac{2}{(1+x)^2} + nx^{n-1} \tan x + x^n \sec^2 x$$

$$(10) y' = \frac{1}{2\sqrt{x-e^{-x}}(1+e^{\frac{1}{x}})}$$

$$4. (1) 2 \quad (2) 0 \quad (3) \frac{2}{5} \quad (4) 1 + \frac{\pi - \sqrt{2}}{2} 4$$

$$(5) \textcircled{-1} \frac{1}{3} (6) \frac{\sqrt{2}}{2} \quad (7) 0 \quad (8) \sin \frac{\pi}{8} + \cos \frac{\pi}{8}$$

$$(9) \frac{\sqrt{2}}{8} (\pi+2) \quad (10) \frac{3}{25}, \frac{17}{15}$$

$$5. 2x+3y-3=0, 3x-2y+2=0$$

习题 2-3

$$1. (1) y' = \frac{a}{y} \quad (2) y' = \frac{y \ln y}{y-x}$$

$$(3) y' = -\frac{1+y \sin(xy)}{x \sin(xy)} \quad (4) y' = \frac{x+y}{x-y}$$

$$(5) y' = \frac{y-2x}{2y-x} \quad (6) y' = \frac{e^x - y \cos(xy)}{e^y + x \cos(xy)}$$

$$(7) y' = \frac{\sqrt{1-x^2} y^2 - y}{3y^2 \sqrt{1-x^2} y^2 + x} \quad (8) y' = \frac{e^y}{1-xe^y}$$

$$(9) y' = \frac{e^{x+y} - y}{x - e^{x+y}} \quad (10) y' = \frac{ye^{xy} - y^2}{2xy - xe^{xy}}$$

$$2. x-y-4=0$$

$$3. x+y-\frac{\sqrt{2}}{2}a=0, y=x$$

$$4. (1) y' = \frac{3b}{2a} t \quad (2) y' = \frac{\sin t}{a(1-\cos t)}$$

$$(3) y' = \frac{\cos \theta - \theta \sin \theta}{1 - \sin \theta - \theta \cos \theta} \quad (4) y' = t$$

$$5. \frac{1-\sqrt{3}}{1+\sqrt{3}}$$

$$6. 2\sqrt{2}x+y-2=0, \sqrt{2}x-4y-1=0$$

$$7. (1) y' = \left(\frac{x}{1+x}\right)^x \left(\ln \frac{x}{1+x} + \frac{1}{1+x}\right)$$

$$(2) y' = \frac{y(y-x \ln y)}{x(x-y \ln x)}$$

$$(3) y' = -(1+\cos x)^{\frac{1}{x}} \left[\frac{\ln(1+\cos x)}{x^2} + \frac{\sin x}{x(1+\cos x)} \right]$$

$$(4) y' = \frac{1^3}{3} \sqrt{\frac{(x-1)^2}{x(x+1)}} \left(\frac{2}{x-1} - \frac{1}{x} - \frac{1}{x+1} \right)$$

$$(5) y' = x^{e^x} \cdot e^x \left(\ln x + \frac{1}{x} \right)$$

$$(6) y' = (\sin x)^{\ln x} \left(\frac{\ln |\sin x|}{x} + \frac{\cos x \ln x}{\sin x} \right)$$

习题 2-4

$$1. (1) y'' = \frac{e^{\sqrt{x}}(1-\sqrt{x})}{4x}$$

$$(2) y'' = e^{\cos x} (\sin^2 x - \cos x)$$

$$(3) y'' = \frac{x\sqrt{x^2-a^2}}{(x^2-a^2)^2} \quad (4) y'' = 2\cos 2x$$

$$(5) \frac{(3x^2+2)\sqrt{(1+x^2)^3} - 3x\sqrt{1+x^2}(x^3+2x)}{(1+x^2)^3}$$

$$(6) y'' = 2\arctan x + \frac{2x}{1+x^2}$$

$$(7) y'' = 4e^{-x} \sin 2x - 3e^{-x} \cos 2x$$

$$(8) y'' = 12x^2 - 36x$$

$$(9) y'' = (6x+4x^3)e^{x^2}$$

$$(10) y'' = \frac{1}{x}$$

$$2. (1) 4\ln^3 2 \quad (2) -102 \quad (3) \frac{1}{2} \quad (4) -\frac{8}{9}$$

$$(5) 1, 2, 6, 24 \quad (6) -\frac{3}{4e^4} \quad (7) 2\sqrt{3} \quad (8) 4e^{-1}$$

$$(9) -1 - \sin 1 \quad (10) 40320$$

3. 略

$$4. -\frac{\sqrt{3}}{2}\pi^2$$

习题 2-5

$$1. (1) 0.0701 \quad (2) 0.07$$

$$2. -0.11$$

$$3. (1) -\frac{x}{\sqrt{1-x^2}} dx \quad (2) \frac{2}{x} dx$$

$$(3) -e^{-x}(\cos x + \sin x) dx \quad (4) 2(e^{2x} - e^{-2x}) dx$$

$$(5) (\sin 2x + 2x \cos 2x) dx$$

$$(6) 8x \tan(1+2x^2) \cdot \sec^2(1+2x^2) dx$$

$$(7) \frac{-2\cos x}{(1+\sin x)^2} dx$$

$$(8) \left\{ \begin{array}{l} -\frac{1}{\sqrt{1-x^2}} dx \quad 0 < x < 1 \\ \frac{1}{\sqrt{1-x^2}} dx \quad -1 < x < 0 \end{array} \right.$$

$$(9) -\frac{e^x}{x^2} \cos e^{\frac{1}{x}} dx \quad (10) 2(x+1) \cot(x+1)^2 dx$$

$$4. 2dx$$

$$5. (1) \frac{\sqrt{3}}{2} + \frac{\pi}{360} \quad (2) 1 + \frac{\pi}{90} \quad (3) 9.987 \quad (4) 1.01e$$

$$6. 30.301, 30$$

$$7. A \approx 2\pi rh$$

自测题参考答案

(一) 判断题

题号	1	2	3	4	5
答案	×	×	√	×	×

(二) 填空题

$$1. \left(\frac{a}{b}\right)^x \ln \frac{a}{b}$$

$$2. -\frac{ab^x}{x^{a+1}}$$

$$3. 10^x \ln 10 + 10x^9 + \frac{1}{x \ln 10} - \sin x$$

$$4. \frac{1}{\cos x} \quad 5. 0 \quad 6. 1$$

$$7. (0,0), (1,1), (2,0)$$

$$8. e$$

$$9. 0.99$$

$$10. -\frac{2}{x} dx$$

$$11. 1+x$$

$$12. e^x [\cos(-x) + \sin(-x)] dx$$