MATH 201 EXERCISES (Calculus, Classic Edition by Swokowski)

16.1	1, 3, 5, 8, 9, 14, 21, 22, 23, 24, 37
16.2	3, 5, 6, 9, 12, 14, 16, 19, 20, 25, 26, 28, 29, 37, 38, 42

Find the following limits, if they exist:

(1) $\lim_{(x,y)\to(1,2)} \frac{xy-2x-y+2}{x^2+y^2-2x-2y+5}$ (2) $\lim_{(x,y)\to(1,1)} \frac{x-y^4}{x^3-y^4}$ (3) $\lim_{(x,y)\to(0,0)} \frac{3xy}{5x^4+2y^4}$

(4) $\lim_{(x,y)\to(0,0)} \frac{3x^3-2x^2y+3y^2x-2y^3}{x^2+y^2}$ (5) $\lim_{(x,y)\to(0,0)} \frac{10xy}{5x^3+2y^3}$ (6) $\lim_{(x,y)\to(0,1)} \frac{x+(y-1)^3}{\sqrt{x^2+(y-1)^2}}$

(7) $\lim_{(x,y,z)\to(0,0,0)} \frac{xy+yz+zx}{x^2+y^2+z^2}$ (8) $\lim_{(x,y)\to(0,0)} \frac{xy^3}{x^3+y^6}$ (9) $\lim_{(x,y,z)\to(0,0,0)} \frac{y^3+x^3 \sin z^3}{x^2+y^2+z^2}$

(10) $\lim_{(x,y)\to(2,1)} \frac{(y-1)(x-2)^2}{(y-1)^3+(x-2)^3}$ (11) $\lim_{(x,y)\to(0,0)} \frac{3x^2y}{x^4+y^2}$ (12) $\lim_{(x,y,z)\to(0,0,0)} \frac{xy^2}{x^2+y^2+z^2}$

(13) $\lim_{(x,y)\to(1,1)} \frac{3x^3+xy^2-3xy-y^3}{x^2-y^2}$ (14) $\lim_{(x,y)\to(0,0)} \frac{x}{y^2} - \frac{x}{e^{y^2}}$ (15) $\lim_{(x,y)\to(0,0)} \frac{xy}{\sqrt{x^2+y^2}}$

(16) $\lim_{(x,y,z)\to(0,0,0)} f(x,y,z)$ where $f(x,y,z) = \begin{cases} \frac{3xyz}{x^2+y^2+z^2}, & (x,y,z) \neq (0,0,0) \\ 0 & (x,y,z) = (0,0,0) \end{cases}$

Discuss the continuity of the following functions on their domain

(1) $f(x,y) = \begin{cases} \frac{x^3+y^3}{x^2+y^2}, & (x,y) \neq (0,0) \\ 0 & (x,y) = (0,0) \end{cases}$ (2) $f(x,y) = \begin{cases} \frac{x^2y}{x^4+y^2}, & (x,y) \neq (0,0) \\ 0 & (x,y) = (0,0) \end{cases}$

(3) $f(x,y) = \begin{cases} \frac{xy}{|x|+|y|}, & (x,y) \neq (0,0) \\ 0 & (x,y) = (0,0) \end{cases}$ (4) $f(x,y,z) = \begin{cases} \frac{x^3+y^3+z^3}{x^2+y^2+z^2}, & (x,y,z) \neq (0,0,0) \\ 0 & (x,y,z) = (0,0,0) \end{cases}$

(5) $f(x,y,z) = \begin{cases} \frac{xz-y^2}{x^2+y^2+z^2}, & (x,y,z) \neq (0,0,0) \\ 0 & (x,y,z) = (0,0,0) \end{cases}$

(6) $f(x,y,z) = \begin{cases} \frac{xzy^2}{x^2+y^2+z^2}, & (x,y,z) \neq (0,0,0) \\ 0 & (x,y,z) = (0,0,0) \end{cases}$

Discuss the continuity of the following functions on their domain

(1) $h(x,y) = e^{x^2+5xy+y^2}$ (2) $h(x,y) = \sin\sqrt{y-4x^2}$

(3) $h(x,y,z) = \ln(36-4x^2-y^2-9z^2)$ (4) $h(x,y,z) = \frac{xz}{\sqrt{x^2+y^2+z^2-1}}$

16.3	4, 6, 8, 12, 13, 16, 17, 21, 22, 27, 29, 32, 34, 36, 39, 42, 47
	Use the definition to find f_x and f_y for the function $f(x,y) = 3x^2 - 2xy + y^2$
	Let $f(x,y) = e^{x-y}\sin(x+y)$. Show that $(f_x)^2 + \left(f_y\right)^2 = \frac{2(f(x,y))^2}{sin^2(x+y)}$
16.4	2, 9, 11, 12, 16, 18, 20, 39, 41
	Use the differential to approximate the change in the function $w = f(x,y,z) = x^2\ln(y^2+z^2)$ as (x,y,z) changes from $(1,2,3)$ to $(0.9,1.9,3.1)$
	Use the differential to approximate the change in the function $w = f(x,y) = yx^{\frac{2}{5}} + \sqrt{x-y}$ as (x,y) changes from $(52,16)$ to $(35,18)$
	Let $f(x,y,z) = \begin{cases} \frac{xy^2z}{x^4+y^4+z^4}, & (x,y,z) \neq (0,0,0) \\ 0 & (x,y,z) = (0,0,0) \end{cases}$ (a) Show that $f_x(0,0,0)$, $f_y(0,0,0)$ and $f_z(0,0,0)$ exist (b) Discuss the differentiability of $f(x,y,z)$ at $(0,0,0)$
16.5	2, 4, 6, 10, 12, 14, 18, 19, 22, 33, 37, 38, 41, 42
	Let $w = f(x,y,z) = x^2 + y^2 + z^2$, where $x = rcos\,\theta$, $y = rsin\,\theta$ and $z = r$. Use the differentials to show that $dw = 4rdr$
	Let $z = f(x,y)$ be determined implicitly by $x^2 + z^2 + \cos(xyz) - 4 = 0$. Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$, then show that $2y\frac{\partial z}{\partial y} - x\frac{\partial z}{\partial x} = \frac{xyz\sin(xyz)}{2z - xy\sin(xyz)}$
16.8	1, 9, 11, 15, 20, 21, 23, 24, 26, 29, 31, 32
16.9	1, 2, 3, 11
17.1	1, 2, 4, 7, 10, 13, 16, 18, 19, 20, 21, 23, 25, 26, 27, 29, 31, 32, 33, 37, 38, 39, 43, 44, 50
	Sketch the region R bounded by the graphs of $y = x$, $y = \sqrt{x}$ and $x = 0$ then evaluate the integral $\iint_R \sin y^2 dA$
	Evaluate the double integral $\int_0^2 \int_{y/2}^1 e^{x^2} dxdy$
17.2	2, 4, 6, 7, 11, 14, 18, 22, 24, 27, 28, 30, 31, 32
	Sketch the region bounded by the graphs of the equations $y = \sin x$, $y = \cos x$, $x = 0$ and $x = \frac{\pi}{4}$ then use a double integral to find its area.
17.3	1, 2, 3, 7, 8, 9, 10, 12, 13, 15, 17, 18, 19, 21, 23, 24
	Use polar coordinates to evaluate the double integral $\int_{-3}^{3} \int_0^{\sqrt{9-x^2}} (x^2+y^2)^{\frac{3}{2}} dydx$
17.5	2, 6, 7, 8, 9, 11, 12, 13, 14, 16, 17, 23, 26, 28
17.7	2, 6, 7, 13, 18, 20, 23, 30(a), 40
17.8	2, 3, 11, 14, 25, 28, 35, 36, 39, 40

11.1	3, 5,7, 11, 12, 13, 16, 17, 18, 20, 22, 23, 24, 27—38, 41, 42
11.2	2, 4, 5, 6, 8, 10, 14, 15, 18, 20, 25, 28, 30, 34, 37, 38, 39, 40, 42, 43, 45, 46, 50, 57, 58
11.3	2—10, 14, 15, 16, 18, 20, 22, 23, 24, 25, 26, 30, 31, 33, 34, 35, 39, 40, 42, 43, 45, 46, 57, 58
11.4	2, 4, 6, 8, 9, 10, 11, 12, 14, 15, 16, 18, 20, 21, 22, 23, 25, 27, 28, 29, 31, 32, 33, 34, 35, 38
11.5	2—7, 9, 10, 12, 13, 14, 16, 19, 20, 21, 22, 27, 28, 29, 32, 43, 44, 45, 46
11.6	5, 6, 7, 8, 14, 15, 19, 23, 25, 27, 30 35, 36, 41, 42, 44, 45, 46
11.7	2, 4, 6, 7, 10, 13, 14, 16, 19, 22, 25, 29, 30, 32, 33, 34, 37
11.8	2, 4, 8, 10, 13, 15, 18, 19, 21, 26