1. Does the sequence $\{a_n\}$ converge or diverge? Find the limit if the sequence is convergent.

$$a_n = \frac{1-6n^4}{n^4+2n^3}$$

Select the correct choice below and, if necessary, fill in the answer box to complete the choice.

- **A.** The sequence converges to $\lim_{n\to\infty} a_n =$ ________. (Simplify your answer.)
- **B.** The sequence diverges.

ID: 9.1.35

2. Does the series shown below converge or diverge? Give a reason for your answer. (When you check your answer, remember that there may be more than one way to determine the series' convergence or divergence.)

$$\sum_{n=1}^{\infty} \frac{3n}{3n+1}$$

Choose the correct answer below.

- **A.** Diverges (nth-term test)
- **B.** Diverges (geometric series)
- **C.** Converges (nth-term test)
- **D.** Converges (geometric series)

ID: 9.3.15

3. Find all the local maxima, local minima, and saddle points of the function.

$$f(x,y) = 2xy - x^2 - 3y^2 + 3x + 1$$

Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

- **A.** A local maximum occurs at ________.
  (Type an ordered pair. Use a comma to separate answers as needed.)
  The local maximum value(s) is/are ________.
  (Type an exact answer. Use a comma to separate answers as needed.)
- **B.** There are no local maxima.

Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

- **A.** A local minimum occurs at ________.
  (Type an ordered pair. Use a comma to separate answers as needed.)
  The local minimum value(s) is/are ________.
  (Type an exact answer. Use a comma to separate answers as needed.)
- **B.** There are no local minima.

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** A saddle point occurs at ________.
  (Type an ordered pair. Use a comma to separate answers as needed.)
- **B.** There are no saddle points.

ID: 13.7.5

4. Evaluate the double integral over the given region R.

$$\iint_R e^{x-y}\,dx\,dy \quad R: 0 \le x \le \ln(3),\ 0 \le y \le \ln(4)$$

$\iint_R e^{x-y}\,dx\,dy =$ ________ (Type an integer or a simplified fraction.)

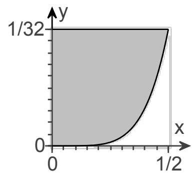
ID: 14.1.21

5. Sketch the region of integration, reverse the order of integration, and evaluate the integral.

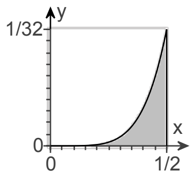
$$\int_{0}^{1/32} \int_{y^{1/5}}^{1/2} \cos\left(32\pi x^6\right) dx\, dy$$

Choose the correct sketch below that describes the region R from the double integral.

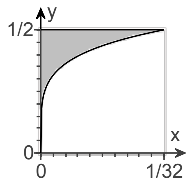
- A.



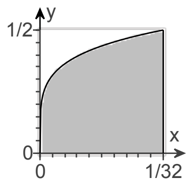
- B.



- C.



- D.



What is an equivalent double integral with the order of integration reversed?

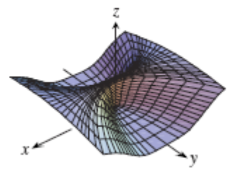
$$\int_{\_\_\_}^{\_\_\_} \int_{\_\_\_}^{\_\_\_} \cos\left(32\pi x^6\right) dy\, dx$$

The value of the integral is __________. (Type an exact answer, using π as needed.)

ID: 14.2.53

6. By considering different paths of approach, show that the function below has no limit as $(x,y)\to(0,0)$.

$$f(x,y) = \frac{x^4}{x^4 + y^2}$$



Examine the values of f along curves that end at (0,0). Along which set of curves is f a constant value?

- A. $y = kx + kx^2,\ x \neq 0$
- B. $y = kx,\ x \neq 0$
- C. $y = kx^3,\ x \neq 0$
- D. $y = kx^2,\ x \neq 0$

If (x,y) approaches (0,0) along the curve when $k = 1$ used in the set of curves found above, what is the limit?

__________ (Simplify your answer.)

If (x,y) approaches (0,0) along the curve when $k = 0$ used in the set of curves found above, what is the limit?

__________ (Simplify your answer.)

What can you conclude?

- A. Since f has two different limits along two different paths to (0,0), in cannot be determined whether or not f has a limit as (x,y) approaches (0,0).
- B. Since f has two different limits along two different paths to (0,0), by the two-path test, f has no limit as (x,y) approaches (0,0).
- C. Since f has the same limit along two different paths to (0,0), in cannot be determined whether or not f has a limit as (x,y) approaches (0,0).
- D. Since f has the same limit along two different paths to (0,0), by the two-path test, f has no limit as (x,y) approaches (0,0).

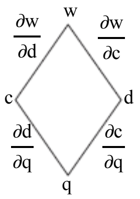
ID: 13.2.42

7. Draw a dependency diagram and write a chain rule formula for $\frac{\partial w}{\partial q}$ and $\frac{\partial w}{\partial r}$ given the functions below.

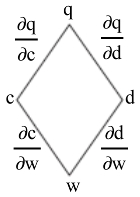
$w = m(c,d)$, $c = f(q,r)$, $d = h(q,r)$

Choose the correct dependency diagram for ∂w / ∂q.

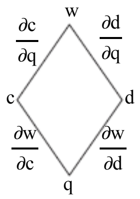
A.



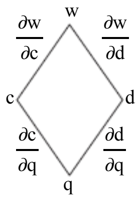
B.



C.



D.



Choose the correct chain rule formula for ∂w / ∂q.

A. $\frac{\partial w}{\partial q} = \frac{\partial w}{\partial c}\frac{\partial w}{\partial d} + \frac{\partial c}{\partial q}\frac{\partial d}{\partial q}$

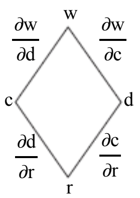
B. $\frac{\partial w}{\partial q} = \frac{\partial w}{\partial c} + \frac{\partial c}{\partial q} + \frac{\partial w}{\partial d} + \frac{\partial d}{\partial q}$

C. $\frac{\partial w}{\partial q} = \frac{\partial w}{\partial c}\frac{\partial c}{\partial q} + \frac{\partial w}{\partial d}\frac{\partial d}{\partial q}$

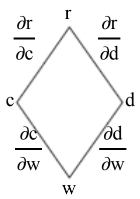
D. $\frac{\partial w}{\partial q} = \frac{\partial w}{\partial c}\frac{\partial d}{\partial q} + \frac{\partial w}{\partial d}\frac{\partial c}{\partial q}$

Choose the correct dependency diagram for ∂w / ∂r.

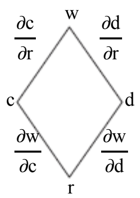
A.



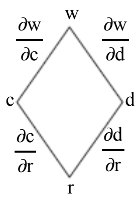
B.



C.



D.



Choose the correct chain rule formula for ∂w / ∂r.

A. $\frac{\partial w}{\partial r} = \frac{\partial w}{\partial c}\frac{\partial d}{\partial r} + \frac{\partial w}{\partial d}\frac{\partial c}{\partial r}$

B. $\frac{\partial w}{\partial r} = \frac{\partial w}{\partial c}\frac{\partial c}{\partial r} + \frac{\partial w}{\partial d}\frac{\partial d}{\partial r}$

C. $\frac{\partial w}{\partial r} = \frac{\partial w}{\partial c}\frac{\partial w}{\partial d} + \frac{\partial c}{\partial r}\frac{\partial d}{\partial r}$

D. $\frac{\partial w}{\partial r} = \frac{\partial w}{\partial c} + \frac{\partial c}{\partial r} + \frac{\partial w}{\partial d} + \frac{\partial d}{\partial r}$

ID: 13.4.19

8. Find the limit by rewriting the fraction first.

$$\lim_{\substack{(x,y)\to(0,0)\\ x\neq y}} \frac{x - y + 10\sqrt{x} - 10\sqrt{y}}{\sqrt{x} - \sqrt{y}}$$

$$\lim_{\substack{(x,y)\to(0,0)\\ x\neq y}} \frac{x - y + 10\sqrt{x} - 10\sqrt{y}}{\sqrt{x} - \sqrt{y}} = \_\_\_\_\_\_$$

(Simplify your answer. Type an exact answer, using radicals as needed.)

ID: 13.2.17

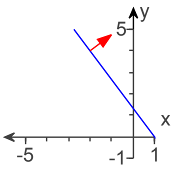
9. Find the gradient of the function $f(x,y) = \sqrt{4x+3y}$ at the point $(-2,4)$. Then sketch the gradient together with the level curve that passes through the point.

$\nabla f|_{(-2,4)} =$ ____ **i** + ____ **j**

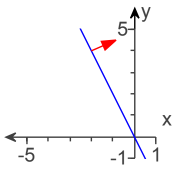
(Type integers or simplified fractions.)

Choose the correct graph below.

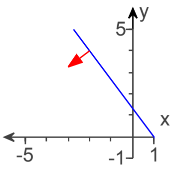
○ **A.**



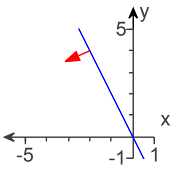
○ **B.**



○ **C.**



○ **D.**



ID: 13.5.5

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10. Determine whether the series $\sum_{m=2}^{\infty} \frac{7}{3^m}$ converges or diverges. If it converges, find its sum.

Select the correct choice below and, if necessary, fill in the answer box within your choice.

○ **A.** The series converges because it is a geometric series with $|r| < 1$. The sum of the series is ____.
(Simplify your answer.)

○ **B.** The series diverges because $\lim_{n\to\infty} \frac{7}{3^m} \neq 0$ or fails to exist.

○ **C.** The series diverges because it is a geometric series with $|r| \geq 1$.

○ **D.** The series converges because $\lim_{n\to\infty} \frac{7}{3^m} = 0$. The sum of the series is ____.
(Simplify your answer.)

ID: 9.2.61

---

11. Find the Taylor polynomials of orders 0, 1, 2, and 3 generated by f at x = a.

$f(x) = \frac{4}{x}, \ a = 2$

$P_0(x) =$ ____

$P_1(x) =$ ____

$P_2(x) =$ ____

$P_3(x) =$ ____

ID: 9.8.5

---

12. Use any method to determine if the series converges or diverges. Give reasons for your answer.

$$\sum_{n=1}^{\infty} \frac{(-8)^n}{9^n}$$

Select the correct choice below and fill in the answer box to complete your choice.

○ **A.** The series diverges because it is a geometric series with r = ____.

○ **B.** The series converges because it is a p-series with p = ____.

○ **C.** The series converges because the limit used in the Ratio Test is ____.

○ **D.** The series diverges per the Integral Test because $\int_1^{\infty} \frac{1}{9^x} dx =$ ____.

ID: 9.5.24

---

13. Find a formula for the nth term of the sequence where a_n is calculated directly from the value of n.

4, 7, 10, 13, 16, ...

a_n = ________, $n \geq 1$

ID: 9.1.21

14. Does the sequence $\{a_n\}$ converge or diverge? Find the limit if the sequence is convergent.

$$a_n = \frac{n!}{5^{2n}}$$

Select the correct choice below and fill in any answer boxes within your choice.

- **A.** The sequence converges to $\lim_{n\to\infty} a_n$ = ________.
  (Simplify your answer.)
- **B.** The sequence diverges.

ID: 9.1.69

15. **(a)** Find the series' radius and interval of convergence. Find the values of x for which the series converges **(b)** absolutely and **(c)** conditionally.

$$\sum_{n=1}^{\infty} \frac{(2x-3)^{2n+1}}{n^{3/2}}$$

(a) The radius of convergence is ________.
(Simplify your answer.)

Determine the interval of convergence. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The interval of convergence is ________.
  (Type a compound inequality. Simplify your answer. Use integers or fractions for any numbers in the expression.)
- **B.** The series converges only at x = ________. (Type an integer or a simplified fraction.)
- **C.** The series converges for all values of x.

(b) For what values of x does the series converge absolutely?

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The series converges absolutely for ________.
  (Type a compound inequality. Simplify your answer. Use integers or fractions for any numbers in the expression.)
- **B.** The series converges absolutely at x = ________. (Type an integer or a simplified fraction.)
- **C.** The series converges absolutely for all values of x.

(c) For what values of x does the series converge conditionally?

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The series converges conditionally for ________.
  (Type a compound inequality. Simplify your answer. Use integers or fractions for any numbers in the expression.)
- **B.** The series converges conditionally at x = ________.
  (Type an integer or a simplified fraction. Use a comma to separate answers as needed.)
- **C.** There are no values of x for which the series converges conditionally.

ID: 9.7.31

16. Does the series $\sum_{n=1}^{\infty} (-1)^n n^2 \left(\frac{4}{7}\right)^n$ converge absolutely, converge conditionally, or diverge?

Choose the correct answer below and, if necessary, fill in the answer box to complete your choice.

- **A.** The series diverges because the limit used in the Ratio Test is not less than or equal to 1.
- **B.** The series converges absolutely since the corresponding series of absolute values is geometric with $|r|$ = ____________.
- **C.** The series converges absolutely because the limit used in the Ratio Test is ____________.
- **D.** The series diverges because the limit used in the nth-Term Test does not exist.
- **E.** The series converges conditionally per the Alternating Series Test and because the limit used in the nth-Term Test is ____________.
- **F.** The series converges conditionally per Alternating Series Test and because the limit used in the Ratio Test is ____________.

ID: 9.6.27

---

17. Find the Taylor series generated by f at x = a.

$f(x) = 4x^4 + 4x^2 + 4,\ a = -3$

The Taylor series generated by f at a = −3 is ____________.

ID: 9.8.27

---

18. Evaluate the iterated integral.

$$\int_{-4}^{5} \int_{0}^{2x} \int_{y}^{x-2} dz\,dy\,dx$$

$\int_{-4}^{5} \int_{0}^{2x} \int_{y}^{x-2} dz\,dy\,dx$ = ____________ (Simplify your answer.)

ID: 14.5.15

---

19. Find f_x, f_y, f_z.

$f(x,y,z) = x - \sqrt{y^2 + 2z^2}$

f_x = ____________ (Type an exact answer, using radicals as needed.)

f_y = ____________ (Type an exact answer, using radicals as needed.)

f_z = ____________ (Type an exact answer, using radicals as needed.)

ID: 13.3.25

---

20. Find the derivative of the function at P_0 in the direction of **A**.

$f(x,y,z) = xy + yz + zx$, $(3,-3,1)$, $\mathbf{A} = 9\mathbf{i} + 6\mathbf{j} - 2\mathbf{k}$

$(D_{\mathbf{A}} f)_{(3,-3,1)}$ = ____________ (Simplify your answer.)

ID: 13.5.15

---

21. Find the Maclaurin series of $f(x) = 6\cos(-x)$.

What is the Maclaurin series of $6\cos(-x)$?

$\sum_{n=0}^{\infty}$ ____________

ID: 9.8.17

22.

Given the function $f(x,y) = 3xy$, answer the following questions.

a. Find the function's domain.
b. Find the function's range.
c. Describe the function's level curves.
d. Find the boundary of the function's domain.
e. Determine if the domain is an open region, a closed region, both, or neither.
f. Decide if the domain is bounded or unbounded.

a. Choose the correct domain of the function $f(x,y) = 3xy$.

- **A.** All points in the first quadrant
- **B.** All points in the xy-plane except the origin
- **C.** $y \geq 3x$
- **D.** All points in the xy-plane

b. Choose the correct range of the function $f(x,y) = 3xy$.

- **A.** All non-negative integers
- **B.** All non-negative real numbers
- **C.** All integers
- **D.** All real numbers

c. Choose the correct description(s) of the level curves of $f(x,y) = 3xy$. Select all that apply.

- **A.** Circles, when $f(x,y) \neq 0$
- **B.** Straight lines, when $f(x,y) \neq 0$
- **C.** Hyperbolas, when $f(x,y) \neq 0$
- **D.** The x- and y-axes, when $f(x,y) = 0$

d. Does the function's domain have a boundary? Select the correct choice and if necessary, fill in the answer box below to complete your choice.

- **A.** Yes, at ________
  (Type an ordered pair. Use a comma to separate answers as needed.)
- **B.** Yes, at ________ = 0
  (Type an expression using x and y as the variables.)
- **C.** No

e. Choose the correct description of the domain of $f(x,y) = 3xy$.

- Neither open nor closed
- Both open and closed
- Open region
- Closed region

f. Is the domain of $f(x,y) = 3xy$ bounded or unbounded?

- Bounded
- Unbounded

ID: 13.1.21

1. A. The sequence converges to $\lim_{n\to\infty} a_n =$ **−6**. (Simplify your answer.)

---

2. A. Diverges (nth-term test)

---

3. A. A local maximum occurs at **(2.25,0.75)**.(Type an ordered pair. Use a comma to separate answers as needed.)
The local maximum value(s) is/are **4.375**.(Type an exact answer. Use a comma to separate answers as needed.)

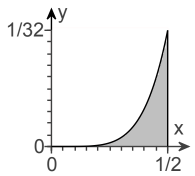
B. There are no local minima.

B. There are no saddle points.

---

4. $\frac{3}{2}$

---

5. 

B.

0

$\frac{1}{2}$

0

x^5

$\frac{1}{192\pi}$

---

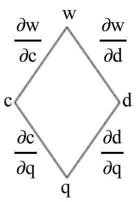
6. D. $y = kx^2, x \neq 0$

$\frac{1}{2}$

1

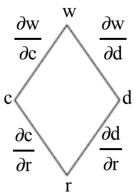
B. Since f has two different limits along two different paths to (0,0), by the two-path test, f has no limit as (x,y) approaches (0,0).

---

7. 

D.

C. $\frac{\partial w}{\partial q} = \frac{\partial w}{\partial c}\frac{\partial c}{\partial q} + \frac{\partial w}{\partial d}\frac{\partial d}{\partial q}$



D.

B. $\frac{\partial w}{\partial r} = \frac{\partial w}{\partial c}\frac{\partial c}{\partial r} + \frac{\partial w}{\partial d}\frac{\partial d}{\partial r}$

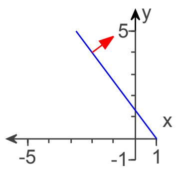
---

8. 10

---

9. 1

$\frac{3}{4}$

A. 

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10. A. The series converges because it is a geometric series with $|r| < 1$. The sum of the series is **$\frac{7}{6}$**.(Simplify your answer.)

---

11. 2

$2 - (x - 2)$

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

$2 - (x - 2) + \frac{1}{2}(x - 2)^2 - \frac{1}{4}(x - 2)^3$

---

12. C. The series converges because the limit used in the Ratio Test is **$\frac{8}{9}$**.

---

13. $3n + 1$

---

14. B. The sequence diverges.

---

15. $\frac{1}{2}$

A. The interval of convergence is **$1 \le x \le 2$**.
(Type a compound inequality. Simplify your answer. Use integers or fractions for any numbers in the expression.)

A. The series converges absolutely for **$1 \le x \le 2$**.
(Type a compound inequality. Simplify your answer. Use integers or fractions for any numbers in the expression.)

C. There are no values of x for which the series converges conditionally.

---

16. C. The series converges absolutely because the limit used in the Ratio Test is **$\frac{4}{7}$**.

---

17. $364 - 456(x + 3) + 220(x + 3)^2 - 48(x + 3)^3 + 4(x + 3)^4$

---

18. -18

---

19. 1

$-\frac{y}{\sqrt{y^2 + 2z^2}}$

$-\frac{2z}{\sqrt{y^2 + 2z^2}}$

---

20. $\frac{6}{11}$

---

21. $\frac{6(-1)^n x^{2n}}{(2n)!}$

---

22. D. All points in the xy-plane

    D. All real numbers

    C. Hyperbolas, when $f(x,y) \neq 0$, D. The x- and y-axes, when $f(x,y) = 0$

    C. No

    Both open and closed

    Unbounded
