---

1. **(1 pt) Library/UVA-Stew5e/setUVA-Stew5e-C02S03-CalcLimits/2-3-12.pg**
Evaluate the limit

$$\lim_{x\to 5} \frac{x^2-3x-10}{x-5}$$

Enter **I** for ∞, **-I** for $-\infty$, and **DNE** if the limit does not exist.
____

Correct Answers:

- `7`

---

2. **(1 pt) Library/Union/setLimitConcepts/3-2-55.pg**
Let $f(x) = 7x^2+5$. Evaluate

$$\lim_{h\to 0} \frac{f(1+h)-f(1)}{h}.$$

(If the limit does not exist, enter "DNE".)
Limit = __________
Correct Answers:

- `14`

---

3. **(1 pt) Library/Utah/Calculus_I/set5_The_Derivative/1210s5p2.pg**
Let

$$f(x) = \frac{x}{\cos x^2}.$$

$f'(x) =$ ____________________.
Correct Answers:

- `(cos(x**2) + 2*sin(x**2)*x**2)/cos(x**2)**2`

---

4. **(1 pt) Library/OSU/high_school_apcalc/dcrev2/prob2.pg**
Find the derivative of

$$f(x) = \frac{(4x+6)^5}{(3x-4)^6}$$

$f'(x) =$
____

Find the derivative of

$$g(x) = \cos^5(\sqrt[6]{x})$$

$g'(x) =$
____

Correct Answers:

- `(4*x + 6)^5*(5*4/(4*x+6) - 6*3/(3*x- 4))/(3*x- 4)^6`
- `-(5/6)*(cos(x^(1/6)))^(5-1)*sin(x^(1/6))*x^(1/6-1)`

---

5. **(1 pt) Library/UVA-Stew5e/setUVA-Stew5e-C03S03-RatesofChange/3-3-01.pg**
Suppose that a particle moves according to the law of motion

$$s = t^2 - 7t + 20, \qquad t \geq 0.$$

(A) Find the velocity at time t.
$v(t) =$ __________
(B) What is the velocity after 3 seconds?
Velocity after 3 seconds = ________
(C) Find all values of t for which the particle is at rest. (If there are no such values, enter 0. If there are more than one value, list them separated by commas.)
t = ________
(D) Use interval notation to indicate when the particle is moving in the positive direction. (If the particle is never moving in the positive direction, enter "" without the quotation marks.)
Answer = __________

Correct Answers:

- `2*t - 7`
- `-1`
- `3.5`
- `(3.5,infinity)`

---

6. **(1 pt) Library/Indiana/Indiana_setIntegrals4FTC/ur_in_4_12.pg**

Let

$$f(x) = \begin{cases} 0 & \text{if } x < -4 \\ 5 & \text{if } -4 \leq x < -1 \\ -2 & \text{if } -1 \leq x < 3 \\ 0 & \text{if } x \geq 3 \end{cases}$$

and

$$g(x) = \int_{-4}^{x} f(t)\,dt$$

Determine the value of each of the following:
(a) $g(-6) =$ ___
(b) $g(-3) =$ ___
(c) $g(0) =$ ___
(d) $g(4) =$ ___
(e) The absolute maximum of $g(x)$ occurs when $x =$ ___ and is the value ___

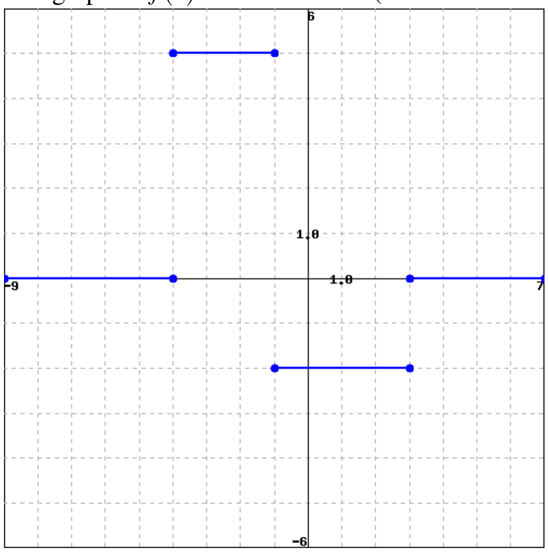
It may be helpful to make a graph of $f(x)$ when answering these questions.

Solution: *(Instructor solution preview: show the student solution after due date.)*

Solution:

As the problem statement suggests, the best method to use in solving this problem is to graph the function $f(x)$. Then, we can use the fact that the integration of a curve on the interval [a,b] can be interpreted as the area underneath that curve between the lines $x = a$ and $x = b$.

The graph of $f(x)$ is shown below (Click on it to enlarge).



(a) $g(-6)$ will be the area under the graph of $f(x)$ for $-6 \leq x \leq -4$. As f is always 0 on that interval in the graph, the area underneath it is clearly 0, making $g(-6) = 0$.

(b) In this case, we want the area underneath the graph of $f(x)$ on the interval $-4 \leq x \leq -3$. On this interval, f is always 5. Therefore, the value of $g(-6)$ is 5.

(c) To compute $g(0)$, note that f takes on two different values on the interval [-4,0]. Between -4 and -1, f has the value 5. Between -1 and 0, f has the value -2. Therefore, the value of $g(0)$ is $5(-1+4)-2(0+1) = 13$.

(d) In computing $g(4)$, we note that again, f takes on different values on the interval [-4,4]. Between -4 and -1, the value is 5. Between -1 and 0 the value is -2. Finally, between 0 and 4, the value is 0. Hence, the value of $g(4)$ is $5(-1+4)-2(3+1)+0(4-3) = 7$.

(e) The maximum value of g occurs at the x for which f has the largest area between -4 and x. Note that between -1 and 3, f actually has a negative value, which would take away from the value of g. Therefore, the maximum value will take place at -1. That value will be the total area underneath the graph between -4 and -1, which is 15.

Correct Answers:

- `0`
- `5`
- `13`
- `7`
- `-1`
- `15`

---

7. **(1 pt) Library/UVA-Stew5e/setUVA-Stew5e-C05S03-FundThmCalc-/5-3-10.pg**

Use part I of the Fundamental Theorem of Calculus to find the derivative of

$$F(x) = \int_x^8 \tan(t^2)dt$$

$F'(x) =$ ______________

[NOTE: Enter a function as your answer.]

Correct Answers:

- `-tan(x^2)`

---

8. **(1 pt) Library/ma123DB/set3/s7_4_31.pg**

The form of the partial fraction decomposition of a rational function is given below.

$$\frac{3x^2+2x+2}{(x-5)(x^2+4)} = \frac{A}{x-5} + \frac{Bx+C}{x^2+4}$$

$A =$ _____ $B =$ _____ $C =$ _____

Now evaluate the indefinite integral.

$\int \frac{3x^2+2x+2}{(x-5)(x^2+4)}dx =$ ______________________

Correct Answers:

- `3`
- `0`
- `2`
- `3*ln(|x-5|)+2*atan(x/2)/2+C`

---

9. **(1 pt) Library/Union/setIntByParts/mec_int1.pg**

Evaluate the indefinite integral.

$\int x\cos^2(4x)\,dx =$ ______________________ $+C$.

Hint: Integrate by parts with $u = x$.

Correct Answers:

- `1/16*[4*x^2+x*sin(8*x)+[cos(8*x)]/8]`

10. **(1 pt) Library/UMN/calculusStewartET/s_7_1_prob07.pg**

If $g(1) = -2$, $g(5) = -5$, and $\int_1^5 g(x)\,dx = -5$, evaluate the integral $\int_1^5 xg'(x)\,dx$.

Answer: ________

Correct Answers:

- `5*-5--2--5`

11. **(1 pt) Library/ma122DB/set13/s6_5_1.pg**

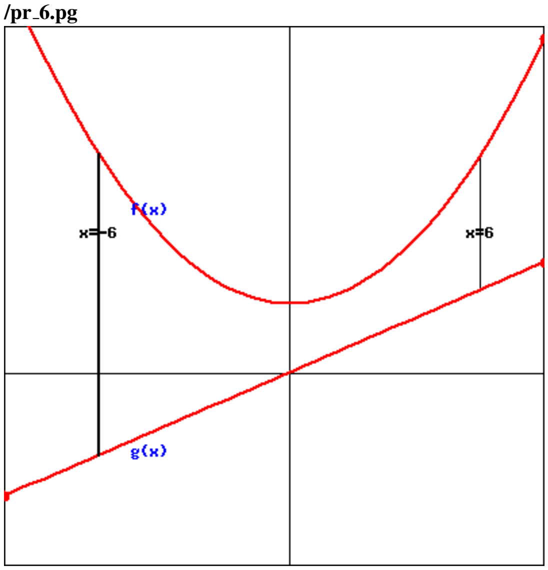
Find the average value of $f(x) = x^4$ on the interval $[1,6]$.

Answer: ________

Correct Answers:

- `(6^(4+1)- (1^(4+1)))/((4+1)*(6-(1)))`

12. **(1 pt) Library/Utah/Quantitative_Analysis/set10_Definite_Integrals_Techniques_of_Integration/pr_6.pg**



Find the area enclosed between
$f(x) = 0.3x^2 + 5$
and
$g(x) = x$
From $x = -6$ to $x = 6$

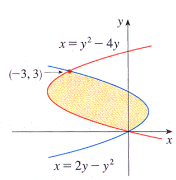
____

Correct Answers:

- `103.2`

13. **(1 pt) Library/UCSB/Stewart5_6_1/Stewart5_6_1_4-/Stewart5_6_1_4.pg**

Find the area of the shaded region below.



Area = ________

Correct Answers:

- `9`

14. **(1 pt) Library/Union/setIntLength/ur_in_21_2.pg**

Find the length of the curve defined by

$$y = 6x^{3/2} + 9$$

from $x = 4$ to $x = 10$.

The length is ________.

Correct Answers:

- `141.866`

15. **(1 pt) Library/UCSB/Stewart5_8_1/Stewart5_8_1_18.pg**

Which of the following integrals represents the length of the curve $y = 2^x$, $0 \le x \le 3$?

- A. $\int_0^3 \sqrt{1 + 2(\ln 2)^2 2^x}\,dx$
- B. $\int_0^3 \sqrt{1 + 2^{2x}}\,dx$
- C. $\int_0^3 \sqrt{1 + 2^x}\,dx$
- D. $\int_0^3 \sqrt{1 + (\ln 2)^2 2^x}\,dx$
- E. $\int_0^3 \sqrt{1 + (\ln 2)^2 2^2}\,dx$
- F. $\int_0^3 \sqrt{1 + (\ln 2)^2 2^{2x}}\,dx$

Correct Answers:

- `F`

16. **(1 pt) Library/Michigan/Chap8Sec2/Q15.pg**

Find the length traced out along the parametric curve $x = \cos(\sin(3t))$, $y = \sin(\sin(3t))$ as t goes through the range $0 \le t \le 1$. (Be sure you can explain why your answer is reasonable).

arc length = ________

Solution: *(Instructor solution preview: show the student solution after due date.)*

SOLUTION

Note that $\left(\frac{dx}{dt}\right)^2 = (3\cos(3t))^2 \sin^2(\sin(3t))$ and $\left(\frac{dy}{dt}\right) = (3\cos(3t))^2 \cos^2(\sin(3t))$. Therefore, the arc length D along the curve is

$$D = \int_0^1 \sqrt{(3\cos(3t))^2\left(\sin^2(\sin(3t)) + \cos^2(\sin(3t))\right)}\,dt = \int_0^1 \sqrt{(3\cos(3t)}$$

$$\int_0^1 |3\cos(3t)|\,dt = \int_0^{\pi/6} 3\cos(3t)\,dt - \int_{\pi/6}^1 3\cos(3t)\,dt =$$

$$\sin(3t)\Big|_0^{\pi/6} - \sin(3t)\Big|_{\pi/6}^1 = 2 - \sin(3).$$

This is the length of the arc of a unit circle from the point $(\cos(0), \sin(0))$ to $(\cos(\sin(3)), \sin(\sin(3)))$ (with retracing: because $\sin(3t)$ increases and then decreases for $0 \le t \le 1$, the actual length traced out is longer than the arclength between $t = 0$ and $t = \sin(3) \approx 0.141$), that is, between the angles $\theta = 0$ and

$\theta = \sin(3)$ (again, with the indicated retracing). The length of this arc is $2 - \sin(3)$.

Correct Answers:

- `2 - sin(3)`

---

17. **(1 pt) Library/Rochester/setIntegrals27SurfaceArea/ur_in_27_3.pg**

Find the area of the surface obtained by rotating the curve

$$y = 1 + 6x^2$$

from $x = 0$ to $x = 9$ about the y-axis.

____

Solution: *(Instructor solution preview: show the student solution after due date.)*

Solution:

$S = \int_0^9 2\pi x\sqrt{1+(y')^2}\,dx = \int_0^9 2\pi x\sqrt{1+144x^2}\,dx$

Make the substitution $u = 1 + 144x^2$, then $du = 288xdx$, $\frac{1}{144} = 2xdx$.

Change the limits of integration:

The new lower limit is $1 + 144 \cdot 0^2 = 1$,

and the new upper limit is $1 + 144 \cdot 9^2 = 11665$.

So we have

$\frac{1}{144}\int_1^{11665} \pi\sqrt{u}du = \frac{1}{144}\left.\frac{2\pi u^{3/2}}{3}\right|_1^{11665} = \frac{2\pi \cdot 11665^{3/2}}{432} - \frac{2\pi}{432} = 18324.1100563161.$

Correct Answers:

- `18324.1100563161`

---

18. **(1 pt) Library/Indiana/Indiana_setDerivatives20Antideriv-/c3s10p4.pg**

A ball is shot at an angle of 45 degrees into the air with initial velocity of 49 ft/sec. Assuming no air resistance, how high does it go?

____

How far away does it land?

____

Hint: The acceleration due to gravity is 32 ft per second squared.

Solution: *(Instructor solution preview: show the student solution after due date.)*

Solution:

First, recall the relationship between position, instantaneous velocity, and instantaneous acceleration. If $s(t)$ is the position of the ball at time t (i.e. the height), $v(t)$ the velocity, and $a(t)$ the acceleration, then:

$$v(t) = s'(t)$$
$$a(t) = v'(t) = s''(t)$$

As the ball is shot at an angle in this example, there are two things happening. First of all, there is velocity, acceleration, and position along the vertical axis. That is, along a line going straight up from the ground. Secondly, there is velocity and position along the horizontal axis, or parallel to the ground. We will analyze these two cases separately.

Part I:

In the first part, we will analyze the ball's movement along the vertical axis. The acceleration due to gravity is 32 feet per second squared downwards, so the acceleration along the vertical axis is given by $a_v(t) = -32$. The velocity along the vertical axis is the antiderivative of the acceleration, or $v_v(t) = -32t + C_1$ where C_1 is a constant. To find that constant, we need to know something about the initial speed of the ball along the vertical axis.

We are told that the initial velocity of the ball is 49 ft/sec vector pointing upwards at a 45 degree angle, or at $\frac{\pi}{4}$ radians. We want the initial speed along the vertical axis, so we need to take the sine component. This is $49 \times \sin(\frac{\pi}{4}) = 34.6482$ will the the initial speed along the vertical axis. Therefore, our velocity formula becomes:

$$v_v(t) = -32t + 34.6482$$

Now, we need to find the formula for the height of the ball, which is the poisition along the vertical axis. This is $s_v(t)$, the antiderivative of the velocity formula we just found. Using the general rules for finding antiderivatives, we see that:

$$s(t) = -16t^2 + 34.6482t + C_2$$

To find out what the constant, C_2, is equal to, we note that the ball is shot from the ground, so the initial height is 0. Therefore, $s(0) = C_2 = 0$. Hence, the final formula for height is:

$$s_v(t) = -16t^2 + 34.6482t$$

Finally, to find out how high the ball goes, we need to think about what happens when the ball reaches its maximum height. At that point, the ball will pause for just an instant before starting to fall back to the ground. It that instant, the velocity of the ball along the vertical axis is 0. So, if we determine the time at which the ball has velocity 0, and then find its height at that time, we will know how high the ball goes.

To find out when the velocity of the ball is 0, we set the velocity formula equal to 0 and compute as follows:

$$\begin{aligned} v_v(t) &= 0 \\ -32t + 34.6482 &= 0 \\ 32t &= 34.6482 \\ t &= \frac{34.6482}{32} = 1.0828 \end{aligned}$$

Therefore, the maximum height of the ball is:

$$s(1.0828) = -16(1.0828)^2 + 34.6482(1.0828) = 18.7578$$

Part II:

For the second part of the question, we can use a similar process as in part I, but instead we want to see what happens along the horizontal axis. Note that the acceleration due to gravity is entirely along the vertical axis. So the acceleration along the horizontal axis, $a_h(t) = 0$.

This means that the velocity formula parallel to the ground is the antiderivative of this, or:

$$v_d(t) = C_3$$

The initial velocity parallel to the ground, $v(0)$ is given by finding the initial speed along the vector parallel to the ground. For this, we use the cosine function to find the component of the initial speed which is parallel to the ground. This is $49 \times \cos(\frac{\pi}{4}) = 34.6482$. Hence, our velocity function is:

$$v_h(t) = 34.6482$$

Then, we can use the antiderivative one more time, along with the fact that the initial horizontal position of the ball can be thought of as 0, to get a distance function:

$$s_h(t) = 34.6482t$$

The last thing we need to do is determine the exact time at which the ball hits the ground. For this, we go back to part I and use the height function developed there, $s_v(t)$. The ball will hit the ground when $s_v(t) = 0$. Note that there are two times for which the height is zero-when the ball is initially shot and when it hits the ground. We are interested in the latter.

$$s_v(t) = 0$$

$$-16t^2 + 34.6482t = 0$$

$$t(-16t + 34.6482) = 0$$

$$-16t + 34.6482 = 0$$

$$t = \frac{34.6482}{16} = 2.1655$$

Therefore, the distance the ball traveled away from the point from which it was shot is:

$$s_h(2.1655) = 34.6482(2.1655) = 75.0312$$

Correct Answers:

- 18.7578119973864
- 75.03125

---

19. **(1 pt) Library/WHFreeman/Rogawski_Calculus_Early_Transcendentals_Second_Edition-/5_The_Integral/5.5_Net_Change_as_the_Integral_of_a_Rate/5.5.7.pg**

A cat falls from a tree (with zero initial velocity) at time $t = 0$. How far does the cat fall between $t = 0.3$ s and $t = 1.3$ s? Use Galileo's formula $v(t) = -32t$ ft/s.

Answer: ___ ft.

Solution: *(Instructor solution preview: show the student solution after due date.)*

Solution:

Given $v(t) = -32t$ ft/s, the total distance the cat falls during the interval $[0.3, 1.3]$ is
$\int_{0.3}^{1.3} |v(t)|\,dt = \int_{0.3}^{1.3} 32t\,dt = 16t^2|_{0.3}^{1.3} = 25.6ft$

Correct Answers:

- 25.6

---

20. **(1 pt) Library/UVA-Stew5e/setUVA-Stew5e-C06S03-VolumesShells/6-3-35.pg**

Find the volume of the solid obtained by rotating the region bounded by the given curves about the specified axis.

$$y = x^2 - 1x - 6, \quad y = 0;$$

about the x-axis.

Volume = ____________

Correct Answers:

- 327.249234748937

---

21. **(1 pt) Library/UMN/calculusStewartCCC/s_11_2_11.pg**

Find the sum of the following infinite series. If it is divergent, type "Diverges" or "D".

$$11 + 2 + \frac{4}{11} + \frac{8}{121} + \cdots$$

Sum: __________

Correct Answers:

- 11+(2/(1-(2/11)))

---

22. **(1 pt) Library/UMN/calculusStewartCCC/s_11_2_44.pg**

Consider the following series. Answer the following questions.

$$\sum_{n=0}^{\infty} \frac{(x+6)^n}{2^n}$$

---

1. Find the values of x for which the series converges.
Answer (in interval notation): ______________

2. Find the sum of the series for those values of x.
Sum: __________

Correct Answers:

- (-8,-4)
- 2/(2-x-6)

---

23. **(1 pt) Library/ma123DB/set10/s11_2_21.pg**

Determine whether the series is convergent or divergent. If convergent, find the sum; if divergent, enter *div* .

$$\sum_{n=1}^{\infty} \frac{n}{n+17}$$

Answer: __________

Correct Answers:

- div

24. **(1 pt) Library/Dartmouth/setStewartCh12S2/problem_5.pg**

Consider the series

$$\sum_{n=1}^{\infty} \frac{n}{3n+7}$$

Determine whether the series converges, and if it converges, determine its value.

Converges (y/n): ______

Value if convergent (blank otherwise): ____________

Correct Answers:

- n
-

25. **(1 pt) Library/Utah/Calculus_II/set7_Infinite_Series/set7_pr15.pg**

Match each of the following with the correct statement.

C stands for Convergent, D stands for Divergent.

___1. $\sum_{n=2}^{\infty} \frac{7}{n^8-64}$

___2. $\sum_{n=1}^{\infty} \frac{3+9^n}{6+6^n}$

___3. $\sum_{n=1}^{\infty} \frac{\ln(n)}{8n}$

___4. $\sum_{n=1}^{\infty} \frac{1}{6+\sqrt[7]{n^3}}$

___5. $\sum_{n=1}^{\infty} \frac{7}{n(n+7)}$

Correct Answers:

- C
- D
- D
- D
- C

26. **(1 pt) Library/FortLewis/Calc2/9-4-Ratio-test/ratio-04.pg**

Use the ratio test to determine whether $\sum_{n=10}^{\infty} \frac{n+8}{n!}$ converges or diverges.

(a) Find the ratio of successive terms. Write your answer as a fully simplified fraction. For $n \geq 10$,

$$\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right| = \lim_{n\to\infty} \_\_\_\_\_\_$$

(b) Evaluate the limit in the previous part. Enter ∞ as *infinity* and $-\infty$ as *-infinity.* If the limit does not exist, enter *DNE.*

$\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right|$ = ______

(c) By the ratio test, does the series converge, diverge, or is the test inconclusive? [?]

Correct Answers:

- n+9
- (n+1)*(n+8)
- 0
- Converges

27. **(1 pt) Library/UMN/calculusStewartCCC/s_11_6_1.pg**

What can you say about the series $\sum a_n$ in each of the following cases using the Ratio Test? Answer "Convergent," "Divergent," or "Inconclusive."

[?] **1.** $\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right| = 0.25$

[?] **2.** $\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right| = 1$

[?] **3.** $\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right| = 4$

Note: *You only have two attempts at this problem.*

Correct Answers:

- Convergent
- Inconclusive
- Divergent

28. **(1 pt) Library/ma123DB/set11/s11_5_5.pg**

Determine whether the following series converges or diverges.

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

Input C for convergence and D for divergence: ___

Note: You have only one chance to enter your answer.

Correct Answers:

- C

29. **(1 pt) Library/WHFreeman/Rogawski_Calculus_Early_Transcendentals_Second_/10_Infinite_Series/10.4_Absolute_and_Conditional_Convergence/10.4.15.pg**

Approximate the value of the series to within an error of at most 10^{-4}.

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{(n+77)(n+71)}$$

According to Equation (2):

$$|S_N - S| \leq a_{N+1}$$

what is the smallest value of N that approximates S to within an error of at most 10^{-4}?

$N =$ ______

$S \approx$ ______

Solution: *(Instructor solution preview: show the student solution after due date.)*

Solution: Let $S = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{(n+77)(n+71)}$, so that $a_n = \frac{1}{(n+77)(n+71)}$. By Equation (2),

$$|S_N - S| \le a_{N+1} = \frac{1}{(N+78)(N+72)}.$$

We must choose N so that

$$\frac{1}{(N+78)(N+72)} \le 10^{-4} \quad \text{or} \quad (N+78)(N+72) \ge 10^4.$$

Solving this quadratic inequality yields $N \ge 25.05$. The smallest value that satisfies the required inequality is then $N = 26$.

Thus

$$S \approx S_{26} = \sum_{n=1}^{26} \frac{(-1)^{n+1}}{(n+77)(n+71)} = 4.06759 \times 10^{-5}$$

Correct Answers:

- `26`
- `4.06759E-05`

---

30. **(1 pt) Library/ma123DB/set12/s11_8_18.pg**

Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{(x-10)^n}{10^n}$$

Answer: __________

Note: Give your answer in **interval notation**

Correct Answers:

- `(0,20)`

---

31. **(1 pt) Library/WHFreeman/Rogawski_Calculus_Early_Transcendentals_Second_Edition-/10_Infinite_Series/10.7_Taylor_Series/10.7.1.pg**

Write out the first four terms of the Maclaurin series of $f(x)$ if

$$f(0) = 11, \qquad f'(0) = 12, \qquad f''(0) = 7, \qquad f'''(0) = 11$$

$f(x) =$ __________ $+ \cdots$

Solution: *(Instructor solution preview: show the student solution after due date.)*

Solution:

The first four terms of the Maclaurin series of $f(x)$ are

$$f(0) + f'(0)x + \frac{f''(0)}{2!}x^2 + \frac{f'''(0)}{3!}x^3$$

$$= 11 + 12x + \frac{7x^2}{2} + \frac{11x^3}{6}.$$

Correct Answers:

- `11+12*x+7*x^2/2+11*x^3/6`

---

32. **(1 pt) Library/Rochester/setSeries9Taylor/e8_7_4.pg**

Match each of the Maclaurin series with the function it represents.

___1. $\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}$

___2. $\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{2n+1}$

___3. $\sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!}$

___4. $\sum_{n=0}^{\infty} \frac{x^n}{n!}$

A. $\sin(x)$
B. $\cos(x)$
C. e^x
D. $\arctan(x)$

Correct Answers:

- `B`
- `D`
- `A`
- `C`

---

33. **(1 pt) Library/Dartmouth/setStewartCh12S10/problem_1.pg**

The function $f(x) = \sin(4x)$ has a Maclaurin series. Find the first 4 nonzero terms in the series, that is write down the Taylor polynomial with 4 nonzero terms.

Correct Answers:

- `4*x - (4**3)/6 * x**3 + (4**5)/120 * x**5 - (4**7)/5040 *`

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34. **(1 pt) Library/FortLewis/Calc2/10-2-Taylor-series/Taylor-series-01.pg**

Find the first four terms of the Taylor series for the function $\frac{5}{x}$ about the point $a = -2$. (Your answers should include the variable x when appropriate.)

$\frac{5}{x} =$ _______ + _______ + _______ + _______ + ...

Solution: *(Instructor solution preview: show the student solution after due date.)*

SOLUTION

The function $\frac{5}{x}$ and its first three derivatives are

$f(x) = \frac{5}{x}$, $f'(x) = -\frac{5}{x^2}$, $f''(x) = \frac{10}{x^3}$, and $f'''(x) = -\frac{30}{x^4}$. Thus, evaluating these at $x = -2$, we get the terms

term 0 = $\frac{5}{-2}$
term 1 = $-\frac{5}{4}(x+2)$
term 2 = $\frac{5}{-8}(x+2)^2$, and

term 3 = $-\frac{5}{16}(x+2)^3$.
Thus the series is

$$\frac{5}{x} = \frac{5}{-2} - \frac{5}{4}(x+2) + \frac{5}{-8}(x+2)^2 - \frac{5}{16}(x+2)^3 + \cdots.$$

Correct Answers:

- `5/(-2)`
- `-5*(x-(-2))/((-2)^2)`
- `5*(x-(-2))^2/((-2)^3)`
- `-5*(x-(-2))^3/((-2)^4)`

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35. (1 pt) Library/Michigan/Chap10Sec2/Q31.pg

By recognizing each series below as a Taylor series evaluated at a particular value of x, find the sum of each convergent series.

A. $1+4+\frac{4^2}{2!}+\frac{4^3}{3!}+\frac{4^4}{4!}+\cdots+\frac{4^n}{n!}+\cdots =$ _____

B. $4-\frac{4^3}{3!}+\frac{4^5}{5!}-\frac{4^7}{7!}+\cdots+\frac{(-1)^n 4^{2n+1}}{(2n+1)!}+\cdots =$ _____

Solution: *(Instructor solution preview: show the student solution after due date.)*

SOLUTION

A. This is the series for e^x with x replaced by 4, so the series converges to e^4.

B. This is the series for e^x with x replaced by 4, so the series converges to $\sin(4)$.

Correct Answers:

- `e^(4)`
- `sin(4)`

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36. (1 pt) Library/Dartmouth/setStewartCh12S10/problem_7.pg

Find the sum of the series

$$\sum_{n=0}^{\infty}(-1)^n \frac{x^{11n}}{n!}$$

It will be a function of the variable x.

Correct Answers:

- `exp(-(x**(11)))`

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37. (1 pt) Library/Michigan/Chap10Sec2/Q43.pg

Suppose that you are told that the Taylor series of $f(x) = x^5 e^{x^3}$ about $x=0$ is

$$x^5 + x^8 + \frac{x^{11}}{2!} + \frac{x^{14}}{3!} + \frac{x^{17}}{4!} + \cdots.$$

Find each of the following:

$\frac{d}{dx}\left(x^5 e^{x^3}\right)\Big|_{x=0} =$ _______

$\frac{d^{11}}{dx^{11}}\left(x^5 e^{x^3}\right)\Big|_{x=0} =$ _______

Solution: *(Instructor solution preview: show the student solution after due date.)*

SOLUTION

From the Taylor series, we know that

$$\frac{d}{dx}x^5 e^{x^3} = 5x^4 + 8x^7 + \cdots.$$

Thus at $x=0$, the derivative is zero. Similarly, the 11th derivative will, when evaluated at zero, be $\frac{(11)!}{2!} = 19958400$.

Correct Answers:

- `0`
- `11!/2`