1. Which of the following is equal to $\frac{e^x - 1 - x}{x^2}$?

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

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

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

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

(e)
$$\sum_{n=0}^{\infty} \frac{x^n}{n!}$$

Title: Nov 25-7:18 PM (1 of 17)

2. Find a unit vector in the direction of $\mathbf{b} - \mathbf{a}$ where $\mathbf{a} = \langle 0, 2, 1 \rangle$ and $\mathbf{b} = \langle 1, 1, 3 \rangle$.

- (a) (1, -1, 2)
- (b) $\left\langle \frac{1}{\sqrt{6}}, -\frac{1}{\sqrt{6}}, \frac{2}{\sqrt{6}} \right\rangle$
- (c) $\left\langle -\frac{1}{\sqrt{6}}, \frac{1}{\sqrt{6}}, -\frac{2}{\sqrt{6}} \right\rangle$
- (d) $\left\langle \frac{1}{\sqrt{26}}, \frac{3}{\sqrt{26}}, \frac{4}{\sqrt{26}} \right\rangle$
- (e) $\langle -1, 1, -2 \rangle$

Title: Nov 25-7:19 PM (2 of 17)

3. Which of the following series converge absolutely?

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

(b)
$$\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n\sqrt{n}}$$

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

(d)
$$\sum_{n=2}^{\infty} \frac{(-1)^n}{\ln n}$$

(e) All of the above series are absolutely convergent.

Title: Nov 25-7:20 PM (3 of 17)

4. What is the intersection of the sphere $(x+1)^2 + (y-2)^2 + (z-3)^2 = 25$ with the xz-plane?

- (a) $(x+1)^2 + (z-3)^2 = 21$
- (b) $(x+1)^2 + (z-3)^2 = 23$
- (c) The point (-1, 2, 3)
- (d) The point (0, 2, 0)
- (e) $(x+1)^2 + (y-2)^2 = 25$

Title: Nov 25-7:20 PM (4 of 17)

5. Given the triangle with vertices A(2, -2, 5), B(1, 1, 4) and C(3, 1, 3), find the cosine of the angle at B.

- (a) $\frac{3}{\sqrt{55}}$ (b) $\frac{1}{\sqrt{55}}$ (c) $\frac{3}{\sqrt{11}}$ (d) $\frac{1}{\sqrt{11}}$

- (e) None of the above.

Title: Nov 25-7:21 PM (5 of 17)

6. If we represent $\frac{1}{9+4x^2}$ as a power series centered at zero, what is the associated radius of convergence

- (a) $R = \frac{4}{9}$ (b) $R = \frac{2}{3}$ (c) $R = \frac{1}{2}$ (d) $R = \frac{9}{4}$ (e) $R = \frac{3}{2}$

Title: Nov 25-7:21 PM (6 of 17)

7. Determine the radius of the sphere given by the equation $x^2 + y^2 + 2y + z^2 + z - 1 = 0$.

- (a) 9/4
- (b) 3/2
- (c) 1
- (d) 5/4
- (e) $\sqrt{5}/2$

Title: Nov 25-7:28 PM (7 of 17)

8. Suppose that the power series $\sum_{n=0}^{\infty} c_n(x-3)^n$ has radius of convergence 3. Consider the following pair of series:

(I)
$$\sum_{n=0}^{\infty} c_n 4^n$$
 and (II) $\sum_{n=0}^{\infty} c_n 2^n$

Which of the following statements is true?

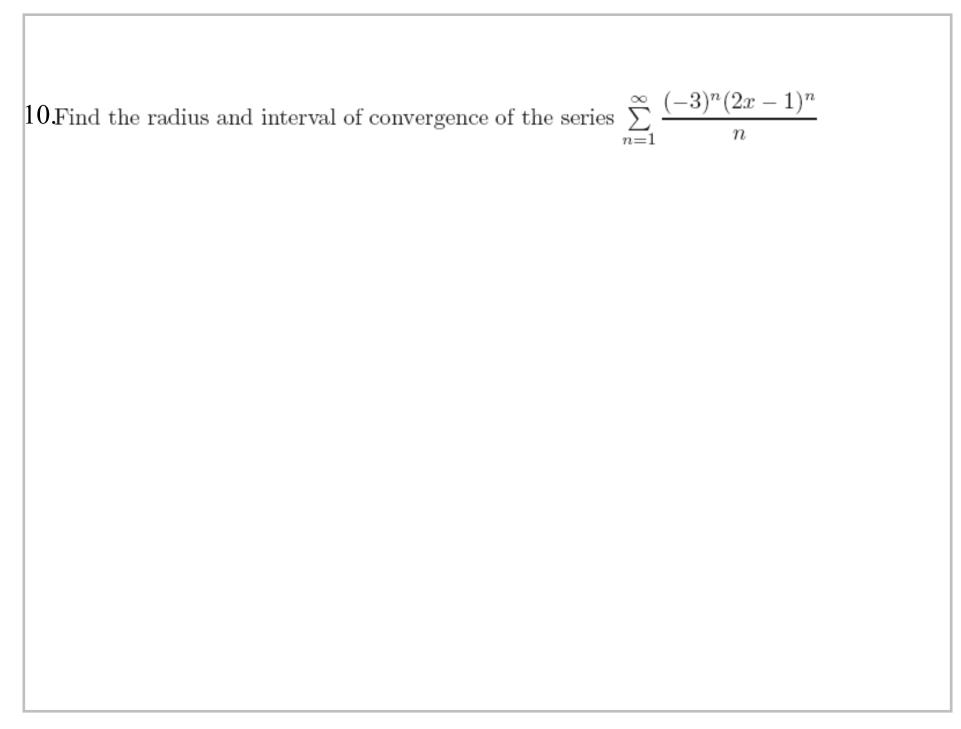
- (a) Neither series is convergent.
- (b) Both series are convergent.
- (c) (I) is convergent, (II) is divergent.
- (d) (I) is divergent, (II) is convergent.
- (e) No conclusion can be drawn about either series.

9. The vertices of a triangle are A(2, 4, 5), B(3, 5, 3), and C(2, 8, -3).

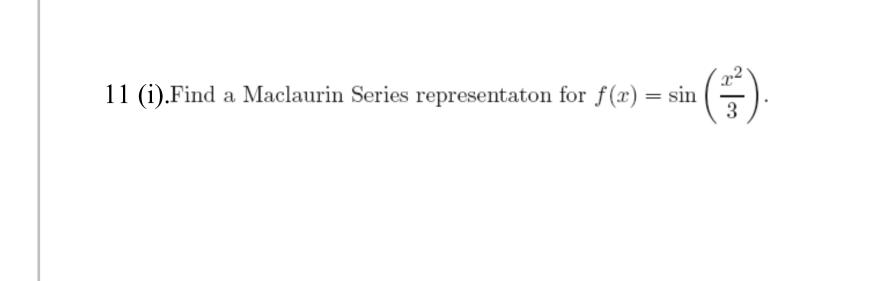
(a) Let $\vec{\mathbf{a}}$ be the vector from A to B, $\vec{\mathbf{b}}$ be the vector from A to C, and $\vec{\mathbf{c}} = \mathbf{proj_b}\vec{\mathbf{a}}$ (the vector projection of $\vec{\mathbf{a}}$ onto $\vec{\mathbf{b}}$). Compute the following: i. $\vec{\mathbf{a}} =$

ii.
$$\vec{b} =$$

iii.
$$\vec{c} =$$



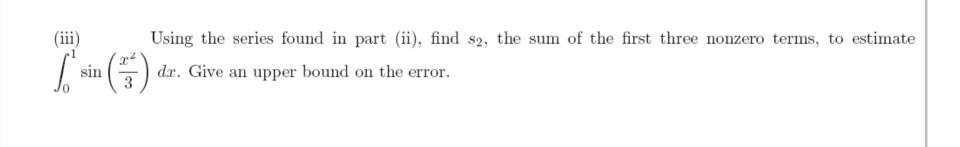
Title: Nov 25-7:21 PM (10 of 17)



Title: Nov 25-7:21 PM (11 of 17)

(ii) Using the result in part (i), write $\int_0^1 \sin\left(\frac{x^2}{3}\right) dx$ as an infinite series.

Title: Nov 25-7:22 PM (12 of 17)



Title: Nov 25-7:22 PM (13 of 17)

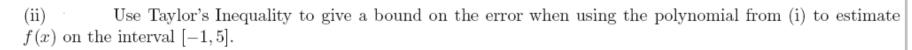
12. Find the Taylor Series for $f(x) = \ln x$ centered at a = 4.

Title: Nov 25-7:22 PM (14 of 17)

13. Let $f(x) = e^{2-x}$.

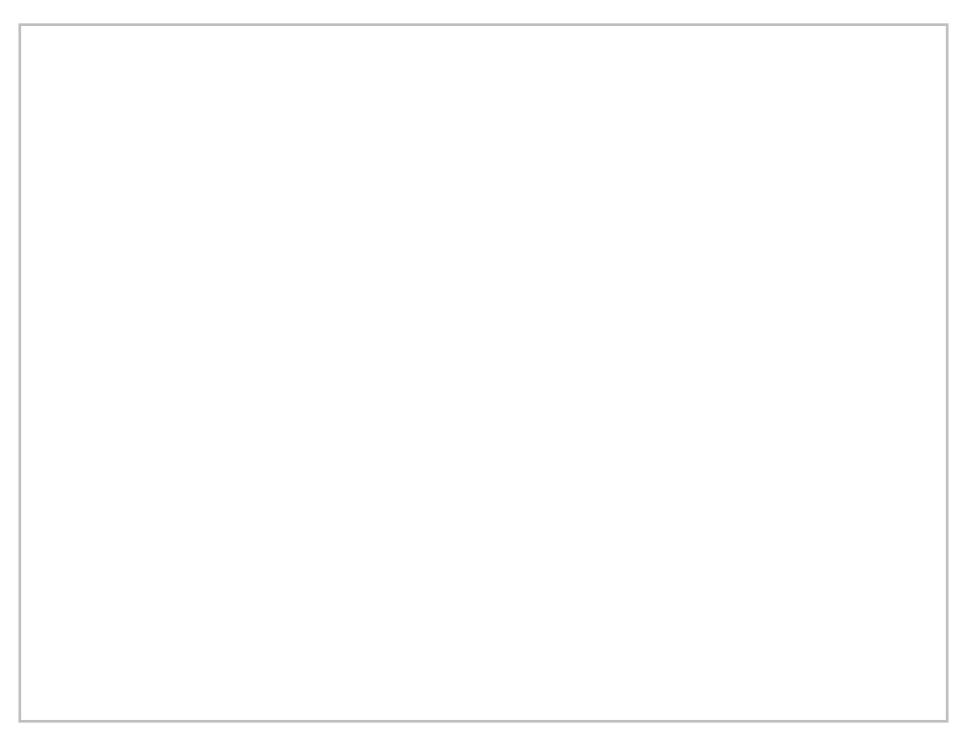
(i) Give the fourth degree Taylor Polynomial for f(x) centered around a = 2.

Title: Nov 25-7:23 PM (15 of 17)



Taylor's Inequality:
$$|R_n(x)| \leq \frac{M}{(n+1)!}|x-a|^{n+1}$$
, where $|f^{(n+1)}(x)| \leq M$ for x in an interval containing a .

Title: Nov 25-7:23 PM (16 of 17)



Title: Nov 25-7:27 PM (17 of 17)