1. Which of the following series is convergent?

A) $\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n}}$

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

C) $\sum_{n=1}^{\infty} \frac{1}{n}$

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

E) $\sum_{n=1}^{\infty} \frac{2}{n^2-5}$

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2. Which of the following series is divergent?

A) $\sum_{n=1}^{\infty} \frac{1}{n^2}$

B) $\sum_{n=1}^{\infty} \frac{1}{n^2+n}$

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

D) $\sum_{n=1}^{\infty} \frac{n}{\sqrt{4n^2-1}}$

E) None of these

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3. The position of a particle moving from the origin in the xy-plane at any time t is given by the vector $\mathbf{r} = \left(3\cos\frac{\pi t}{3}\right)\mathbf{i} + \left(2\sin\frac{2\pi}{3}\right)\mathbf{j}$. The magnitude of the acceleration when $t = 3$ is

A) 2

B) $\frac{\pi^2}{3}$

C) 3

D) $\frac{2\pi^2}{9}$

E) π

4. The series $(x-2)+\dfrac{(x-2)^2}{4}+\dfrac{(x-2)^3}{9}+\dfrac{(x-2)^4}{16}+\cdots$ converges for

A) $1 \leq x \leq 3$

B) $1 \leq x < 3$

C) $1 < x \leq 3$

D) $0 \leq x \leq 4$

E) None of these

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5. Which of the following statements about series is false?

A) $\displaystyle\sum_{n=1}^{\infty} a_n = \sum_{n=k}^{\infty} a_n$ where k is any positive integer.

B) If $\displaystyle\sum_{n=1}^{\infty} a_n$ converges, then so does $\displaystyle\sum_{n=1}^{\infty} ca_n$ where $c \neq 0$.

C) If $\displaystyle\sum_{n=1}^{\infty} a_n$ and $\displaystyle\sum_{n=1}^{\infty} b_n$ converge, then so does $\displaystyle\sum_{n=1}^{\infty}(ca_n + b_n)$ where $c \neq 0$.

D) If 1000 terms are added to a convergent series, the new series also converges.

E) Rearranging the terms of a positive convergent series will not affect its convergence or its sum.

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6. Find the area inside the polar curve $r = 3\cos 3\theta$.

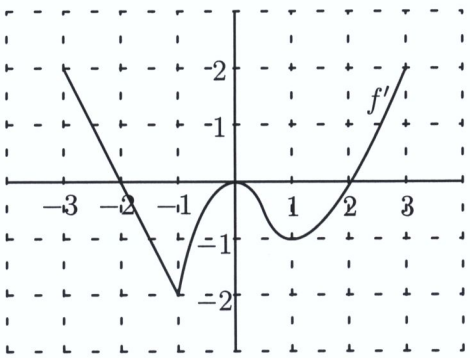
A) $\frac{7\pi}{4}$

B) 2π

C) $\frac{9\pi}{4}$

D) $\frac{5\pi}{2}$

E) $\frac{11\pi}{4}$



7. Above is the graph of $f'(x)$, the derivative of $f(x)$. The domain of f is the interval $-3 \leq x \leq 3$. Which of the following are true about the graph of f ?

I. f is increasing on $-3 < x < -2$.
II. f is concave down on $-3 < x < -1$.
III. The maximum value of $f(x)$ on $-3 < x < 2$ is $f(-3)$.

A) I only

B) II only

C) III only

D) I and II only

E) II and III only

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8. The sales of a small company are expected to grow at a rate given by $\dfrac{dS}{dt} = 300t + t^{1/2} + t^{3/2}$, where $S(t)$ is the sales in dollars in t days. The accumulated sales through the first 4 days is approximately

A) \$2202

B) \$2274

C) \$2346

D) \$2418

E) \$2490

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9. The radius of convergence of the series $\dfrac{x}{4} + \dfrac{x^2}{4^2} + \dfrac{x^3}{4^3} + \cdots + \dfrac{x^n}{4^n} + \cdots$ is

A) ∞

B) 0

C) 1

D) 2

E) 4

10. The position vector of a particle moving in the xy-plane at time t is given by

$$\mathbf{p} = (3t^2 - 4t)\mathbf{i} + (t^2 + 2t)\mathbf{j}.$$

The speed of the particle at $t = 2$ is

A) 2 units per second.

B) $2\sqrt{10}$ units per second.

C) 10 units per second.

D) 14 units per second.

E) 20 units per second.

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11. The coefficient of x^3 in the Taylor series for e^{2x} at $x = 0$ is

A) $\frac{1}{6}$.

B) $\frac{1}{3}$.

C) $\frac{2}{3}$.

D) $\frac{4}{3}$.

E) $\frac{8}{3}$.

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12. Which of the following is an equation for the line tangent to the curve with parametric equations

$$x = \frac{1}{t} \qquad \text{and} \qquad y = \sqrt{t+1}$$

at the point where $t = 3$?

A) $-\frac{4}{9}\left(x - \frac{1}{3}\right) = y - 2$

B) $\frac{1}{4}\left(x - \frac{1}{3}\right) = y - 2$

C) $-\frac{9}{4}\left(x - \frac{1}{3}\right) = y - 2$

D) $-\frac{4}{9}\left(x + \frac{1}{9}\right) = y - \frac{1}{4}$

E) $-\frac{9}{4}\left(x + \frac{1}{9}\right) = y - \frac{1}{4}$

13. The area inside the circle with polar equation $r = 2\sin\theta$ and above the lines with equations $y = x$ and $y = -x$ is given by

A) $\displaystyle\int_{-\pi/4}^{\pi/4} 2\sin^2\theta \; d\theta$

B) $\displaystyle\int_{-1}^{1} 2\sin\theta \; d\theta$

C) $\displaystyle\int_{-1}^{1} (2\sin^2\theta - 1) \; d\theta$

D) $\displaystyle\int_{\pi/4}^{3\pi/4} \sin\theta \; d\theta$

E) $\displaystyle\int_{\pi/4}^{3\pi/4} 2\sin^2\theta \; d\theta$

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14. What is the sum $\dfrac{5}{2} + \dfrac{5}{4} + \dfrac{5}{8} + \dfrac{5}{16} + \cdots$?

A) 2

B) $\frac{75}{16}$

C) $\frac{315}{64}$

D) 5

E) This series diverges

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15. Suppose f is a function whose nth derivative is $f^{(n)}(x) = (2^x + 1)(n + 1)!$ for all x and n. If $f(3) = -2$, what is the fourth-degree Taylor polynomial for f at $x = 3$?

A) $-2 + 18(x-3) + 27(x-3)^2 + 36(x-3)^3 + 45(x-3)^4$

B) $-2 + 18x + 27x^2 + 36x^3 + 45x^4$

C) $-2 + 18(x-3) + 54(x-3)^2 + 216(x-3)^3 + 1080(x-3)^4$

D) $-2 + 18x + 54x^2 + 216x^3 + 1080x^4$

E) $-2 + 18(x-3) + 27(x-3)^2 + 72(x-3)^3 + 270(x-3)^4$