

- Which of these is a definition of  $a^x$  for all positive numbers  $a$  and all real numbers  $x$ ?  
(2017-01-11, 1.1, practice)
  - A.  $\ln(x \cdot e^a)$
  - B.  $a$  multiplied by itself  $x$  times
  - C. the unique function for which  $\frac{d}{dx}[a^x] = a^x$
  - D.  $\exp(x \ln a)$
- Which of these statements is false? (2017-01-11, 1.1, practice)
  - A.  $\ln(abc) = \ln(a) + \ln(b) + \ln(c)$
  - B.  $\frac{d}{dx}[\ln x] = \frac{1}{|x|}$  for all nonzero numbers  $x$
  - C.  $y = \exp(x)$  if and only if  $x = \ln(y)$
  - D.  $e^x = \exp(x)$

1. The Substitution Rule is the opposite of which derivative rule? (2017-01-19, 2.1)

- A. Chain Rule
- B. Product Rule
- C. Quotient Rule
- D. Power Rule

2. What is incorrect about the following attempt at using the Substitution Rule?

$$\int_0^1 (3 - 2x)^5 dx = \int_0^1 u^5 \left( -\frac{1}{2} du \right)$$

(2017-01-19, 2.1)

- A.  $dx$  should have been replaced with  $+\frac{1}{2} du$ .
- B.  $u$  shouldn't be raised to the 5th power.
- C.  $dx$  should have been replaced with  $-2 du$ .
- D. The bounds are incorrect.

3. Which of these formulas would be most useful in finding  $\int \sin^4 \theta \cos^2 \theta \, d\theta$ ? (2017-01-25, 2.2)

A.  $\sin^2(\theta) = \frac{1}{2} + \frac{1}{2} \sin(2\theta)$

B.  $\cos^2(\theta) = \frac{1}{2} + \frac{1}{2} \cos(2\theta)$

C.  $\cos^2(\theta) = 1 - \sin^2(\theta)$

D.  $\sin^2(\theta) = 1 - \cos^2(\theta)$

4. Which of these formulas would be most useful in finding  $\int \sec^4(\theta) \, d\theta$ ? (2017-01-25, 2.2)

A.  $\sec^2(\theta) = 1 + \tan^2(\theta)$

B.  $\sec^2(\theta) = 1 - \tan^2(\theta)$

C.  $\tan^2(\theta) = 1 + \sec^2(\theta)$

D.  $\tan^2(\theta) = 1 - \sec^2(\theta)$

5. Which of these substitutions would be most useful in finding  $\int \frac{1}{25x^2+9} dx$ ? (2017-01-27, 2.3)
- A. Let  $25x^2 + 9 = 25 \sec^2 \theta + 25$ .
  - B. Let  $25x^2 + 9 = 9 \sin^2 \theta + 9$ .
  - C. Let  $25x^2 + 9 = 9 \tan^2 \theta + 9$ .
  - D. Let  $25x^2 + 9 = 25 \cos^2 \theta + 25$ .
6. Which of these substitutions would be most useful in finding  $\int \frac{1}{x\sqrt{4-16x^2}} dx$ ? (2017-01-27, 2.3)
- A. Let  $4 - 16x^2 = 16 - 16 \cos^2 \theta$ .
  - B. Let  $4 - 16x^2 = 4 - 4 \sin^2 \theta$ .
  - C. Let  $4 - 16x^2 = 4 + 4 \tan^2 \theta$ .
  - D. Let  $4 - 16x^2 = 16 + 16 \sec^2 \theta$ .
7. Which of these substitutions would be most useful in finding  $\int_3^5 \frac{1}{\sqrt{x^2-9}} dx$ ? (2017-01-27, 2.3)
- A. Let  $x^2 - 9 = 9 \sin^2 \theta + 9$ .
  - B. Let  $x^2 - 9 = \tan^2 \theta - 1$ .
  - C. Let  $x^2 - 9 = \cos^2 \theta + 1$ .
  - D. Let  $x^2 - 9 = 9 \sec^2 \theta - 9$ .

8. Which of these sums is the first step in expanding  $\frac{4x^2+16x+17}{(x+2)^2(x^2+1)^2}$  into partial fractions?  
(2017-02-01, 2.4)
- A.  $\frac{A}{x+2} + \frac{Bx}{x+2} + \frac{C}{(x^2+1)^2}$
- B.  $\frac{A}{x+2} + \frac{Bx}{(x+2)^2} + \frac{Cx+D}{(x^2+1)^2}$
- C.  $\frac{A}{x+2} + \frac{B}{(x+2)^2} + \frac{Cx+D}{x^2+1} + \frac{Ex+F}{(x^2+1)^2}$
- D.  $\frac{Ax+B}{(x+2)^2} + \frac{Cx+D}{(x^2+1)^2}$
9. Why must  $\frac{3+5x^5}{(x+1)(x+3)^2}$  first be simplified using long polynomial division before using the method of partial fractions? (2017-02-01, 2.4)
- A. It is a rational function of  $x$ .
- B. The degree of its numerator is odd, while the degree of its demoninator is even.
- C. The degree of its numerator is greater than or equal to the degree of its denominator.
- D. It is an irrational function of  $x$ .

10. Which of these techniques is most appropriate as the first step to find  $\int z^2 \sin(z^3) dz$ ?  
(2017-02-09, 2.6)
- A. Integration by Substitution
  - B. Integration by Parts
  - C. Method of Partial Fractions
  - D. Trigonometric Identities
11. Which of these techniques is most appropriate as the first step to find  $\int \frac{t^2+3t+1}{t^3+t} dt$ ?  
(2017-02-09, 2.6)
- A. Method of Partial Fractions
  - B. Trigonometric Substitution
  - C. Trigonometric Identities
  - D. Integration by Substitution

12. Which of these integrals represents the area bounded by the curves  $x = y^2$  and  $x = 4$ ?  
(2017-02-13, 3.1)

A.  $\int_0^4 ((\sqrt{x}) - (-\sqrt{x})) \, dx$

B.  $\int_0^2 ((x^2) - (4)) \, dx$

C.  $\int_2^4 ((x^2) - (-x^2)) \, dx$

D.  $\int_2^0 ((x^2) - (\sqrt{x})) \, dx$

Answer the following questions about the solid of revolution obtained by rotating the triangle with vertices  $(1, 1)$ ,  $(2, 2)$ ,  $(2, 3)$  around the line  $y = -1$ .

13. Which of these curves should be used to find the outer radius  $R(x)$ ? (2017-02-16, 3.3)

- A.  $y = \frac{1}{2}x$
- B.  $y = 2x - 1$
- C.  $y = -2x + 2$
- D.  $y = -\frac{1}{2}x + 1$

14. What formula should be used for  $R(x)$ ? (2017-02-16, 3.3)

- A.  $R(x) = 2x$
- B.  $R(x) = 1 - 2x$
- C.  $R(x) = 2 - \frac{1}{2}x$
- D.  $R(x) = \frac{1}{2}x - 1$

15. What are the correct bounds for the washer method integral? (2017-02-16, 3.3)

- A.  $\pi \int_{-1}^3 ([R(x)]^2 - [r(x)]^2) dx$
- B.  $\pi \int_2^3 ([R(x)]^2 - [r(x)]^2) dx$
- C.  $\pi \int_1^2 ([R(x)]^2 - [r(x)]^2) dx$
- D.  $\pi \int_0^2 ([R(x)]^2 - [r(x)]^2) dx$



16. In the work integral  $\int_a^b F(x) dx$ , the function  $F(x)$  represents... (2017-02-24, 3.5)
- A. Friction
  - B. Speed
  - C. Force
  - D. Mass
17. When computing the work done in pumping water out of a container, the video suggests using which formula? (2017-02-24, 3.5)
- A.  $\int_{y=c}^{y=d} dW$
  - B.  $\int_a^b F(x) dx$
  - C.  $\int_a^b \frac{W(x)}{x} dx$
  - D.  $\int_{y=c}^{y=d} yF(y) dy$

18. The equations  $x = 3 + 4 \cos(t)$ ,  $y = -2 + 4 \sin(t)$  for  $0 \leq t \leq 2\pi$  parametrize which kind of curve? (2017-03-01, 4.1)
- A. A parabola
  - B. A line segment
  - C. A circle oriented counter-clockwise
  - D. A circle oriented clockwise
19. The equations  $x = 3 + 4t$ ,  $y = -2 + 4t$  for  $0 \leq t \leq 2\pi$  parametrize which kind of curve? (2017-03-01, 4.1)
- A. A parabola
  - B. A line segment
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20. The formula  $\frac{dy}{dt} = \frac{dy}{dx} \frac{dx}{dt}$  for computing the slope of a tangent line to a curve defined by parametric equations is a result of the... (2017-03-02, 4.2)
- A. Product Rule
  - B. Pythagorean Theorem
  - C. Method of Partial Fractions
  - D. Chain Rule
21. The formula  $L = \int_a^b \sqrt{[dx/dt]^2 + [dy/dt]^2} dt$  for computing arclength is a result of the... (2017-03-02, 4.2)
- A. Product Rule
  - B. Pythagorean Theorem
  - C. Method of Partial Fractions
  - D. Chain Rule

22. Find the first few terms of the sequence defined recursively by  $a_0 = 1$ ,  $a_1 = 2$ ,  $a_{n+2} = 2a_n + a_{n+1}$ . (2017-03-22, 5.1)
- A.  $\langle 1, 2, 3, 4, 5, \dots \rangle$
  - B.  $\langle 1, 2, 3, 5, 8, \dots \rangle$
  - C.  $\langle 1, 2, 4, 8, 16, \dots \rangle$
  - D.  $\langle 1, 2, 4, 7, 15, \dots \rangle$
23. The limit  $\lim_{n \rightarrow \infty} \frac{n}{1 + n^2}$  is equal to which of the following limits? (2017-03-22, 5.2)
- A.  $\lim_{n \rightarrow 0} \frac{1 + n^2}{n}$
  - B.  $\lim_{x \rightarrow \infty} \frac{x}{1 + x^2}$
  - C.  $\lim_{x \rightarrow 0} \left( x + \frac{1}{x} \right)$
  - D.  $\lim_{n \rightarrow \infty} \left( n + \frac{1}{n} \right)$
24. Which of the following describes the sequence  $\langle (-\frac{2}{3})^n \rangle_{n=0}^\infty = \langle 1, -\frac{2}{3}, \frac{4}{9}, -\frac{8}{27}, \dots \rangle$ ? (2017-03-22, 5.2)
- A. It is bounded and monotonic, and therefore convergent by the Monotonic Sequence Theorem.
  - B. It is bounded and convergent, but not monotonic.
  - C. It is monotonic, but not bounded nor convergent.
  - D. It is convergent and monotonic, but not bounded.

25. Which of the following statements about the sequence  $\langle (\frac{1}{2})^n \rangle_{n=0}^\infty = \langle 1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots \rangle$  is false?  
(2017-03-27, 5.3)
- A. The sequence is bounded and monotonic, and therefore convergent by the Monotonic Sequence Theorem.
  - B. Its partial sum sequence  $\langle 1, 1 + \frac{1}{2}, 1 + \frac{1}{2} + \frac{1}{4}, \dots \rangle = \langle 1, \frac{3}{2}, \frac{7}{4}, \dots \rangle$  is bounded and monotonic, and therefore convergent by the Monotonic Sequence Theorem.
  - C. Its corresponding series  $\sum_{n=0}^\infty (\frac{1}{2})^n = 1 + \frac{1}{2} + \frac{1}{4} + \dots$  converges to  $\frac{1}{1-\frac{1}{2}} = 2$ .
  - D. Its corresponding series  $\sum_{n=0}^\infty (\frac{1}{2})^n = 1 + \frac{1}{2} + \frac{1}{4} + \dots$  is an infinite sum and therefore does not exist.

26. Which of these techniques is NOT valid for determining the convergence of  $\sum_{n=0}^{\infty} \left(\frac{1}{e}\right)^n$ ?

(2017-03-31, 5.5)

A. Geometric Series: converges to  $\frac{1}{1+\frac{1}{e}}$  because  $|\frac{1}{e}| < 1$

B. Series Convergence Test: converges because  $\lim_{n \rightarrow \infty} \frac{1}{e^n} = 0$ .

C. Integral Test: converges because  $\int_0^{\infty} e^{-x} dx$  converges

27. Which of these series converges? (2017-03-31, 5.5)

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

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

C.  $\sum_{n=2}^{\infty} \frac{1}{\sqrt{n-1}}$

D.  $\sum_{n=4}^{\infty} \frac{1}{n^{1/3}}$