1.

$$\lim_{h \to 0} \frac{e^4 e^h - e^4}{h} =$$

A) e

B) 1

C) e^h

2.

The graph of function g defined by

$$g(x) = \frac{x^3 + 2x^2 - 3x}{x^2 + 2x - 3}$$

will have vertical asymptotes at

A) $x = 1$, -3

B) $x = 0$

C) $x = 1$

D) $x = -3$

E) Function g has no vertical asymptotes

3.

Given that

$$\lim_{x \to 0} \frac{\sin x}{x} = 1$$

find

$$\lim_{x \to 0} \frac{x + 4x^2 + \sin x}{3x}$$

A) 2/3

B) 4/3

C) 1/3

D) 2

4.

Function f is defined by

$$f(x) = 2x^3 \sin(x) + \frac{1}{x}\tan(x) + x\sec(x) + 2$$

Find df(x) / dx.

A) $6x^2 \sin(x) - (1/x^2)\tan(x) + \sec(x)$

B) $6x^2 \sin(x) + 2x^3 \cos(x) - (1/x^2)\tan(x) + (1/x) \sec^2(x)) + \sec(x) + x \sin(x) \sec^2(x)$

C) $2x^3 \cos(x) + 1/x \sec^2(x)) + x \sin(x) \sec^2(x)$

D) $6x^2 \cos(x) - (1/x^2 \sec^2(x)) + \sec^2(x)$

E) $6x^2 \sin(x) + 2x^3 \cos(x) - (1/x^2)\tan(x) + (1/x \sec^2(x)) + \sec(x) + x \sin(x) \sec^2(x) + 2$

5.

Curve C is described by the equation $0.25x^2 + y^2 = 9$. Determine the y coordinates of the points on curve C whose tangent lines have slope equal to 1.

A) -3 sqrt(5) / 5 , 3 sqrt(5) / 5

B) - sqrt(35) / 2 , sqrt(35) / 2

C) -3 , 3

D) - sqrt(2) / 2 , sqrt(2) / 2

E) -3 sqrt(2) , 3 sqrt(2)

6.

Find the solution to the differential equation $dy/dx = \cos(x) / y^2$, where $y(\pi/2) = 0$.

A) $y = (3 \sin(x) - 3)$

B) $y = \sin(x) - 1$

C) $y = (3 \sin(x) - 3)^{1/3}$

D) $y = (3 \sin(x) - 3)^3$

E) $y = (3 \sin(x) - 3)^{-1/3}$

7.

$$\int \cos^4(x)\sin(x)\,dx =$$

A) $\cos^5(x) + C$

B) $-(1/5)\sin^5(x) + C$

C) $\sin^5(x) + C$

D) $-(1/5)\cos^5(x) + C$

E) $-5\cos^5(x) + C$

8.

$$\frac{d}{dx}\int_{3}^{2x} \sin(t^2+1)\,dt =$$

A) $2\sin(4x^2 + 1)$

B) $2\sin(x^2 + 1)$

C) $\sin(x^2 + 1)$

D) $2\sin(4x^2 + 1) - 2\sin(3^2 + 1)$

E) $2\sin(4x^2)$

9.

$$\int_0^{10} (|4-x|+|2-2x|)\,dx =$$

A) 100

B) 108

C) 110

D) 112

E) 114

10.

Evaluate the integral

$$\int \frac{(5+x^{3/4})^9}{(x^{1/4})}\,dx$$

A) $(5 + x^{3/4})^{10}$

B) $(x^{3/4})$

C) $(1/10)(5 + x^{3/4})^{10}$

D) $(1/10)(5 + x^{3/4})^{10} / x^{1/4}$

E) $(2/15)(5 + x^{3/4})^{10}$

11.

Given that function *h* is defined by

$$h(x) = (\arctan(x^3 + 1) + 2x)^4$$

find *h'(x)*.

A) $(3x^2 / (x^6 + 2x^3 + 2) + 2)$

B) $4 (\arctan(x^3 + 1) + 2x)^3 (3x^2 / (x^6 + 2x^3 + 2))$

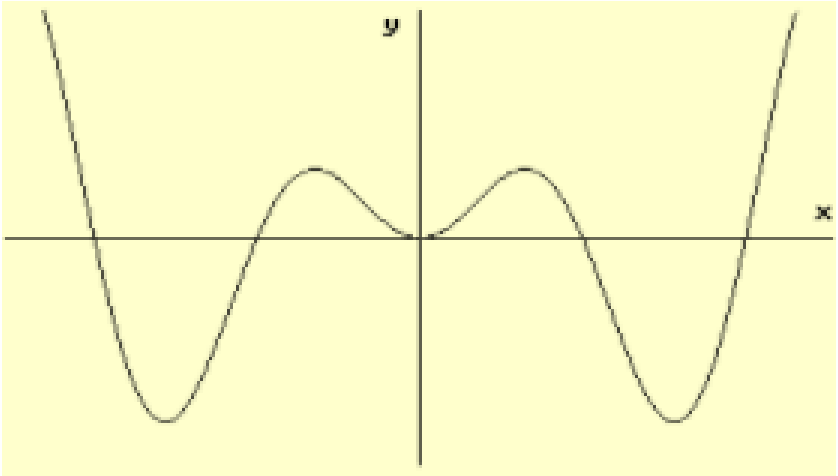
C) $4 (\arctan(x^3 + 1) + 2x)^3$

D) $4 (3x^2 / (x^6 + 2x^3 + 2) + 2)$

E) $(1/4)(\arctan(x^3 + 1) + 2x)^3$

12.

The graph of function h is shown below. How many zeros does the first derivative h' of h have?



A) 1

B) 2

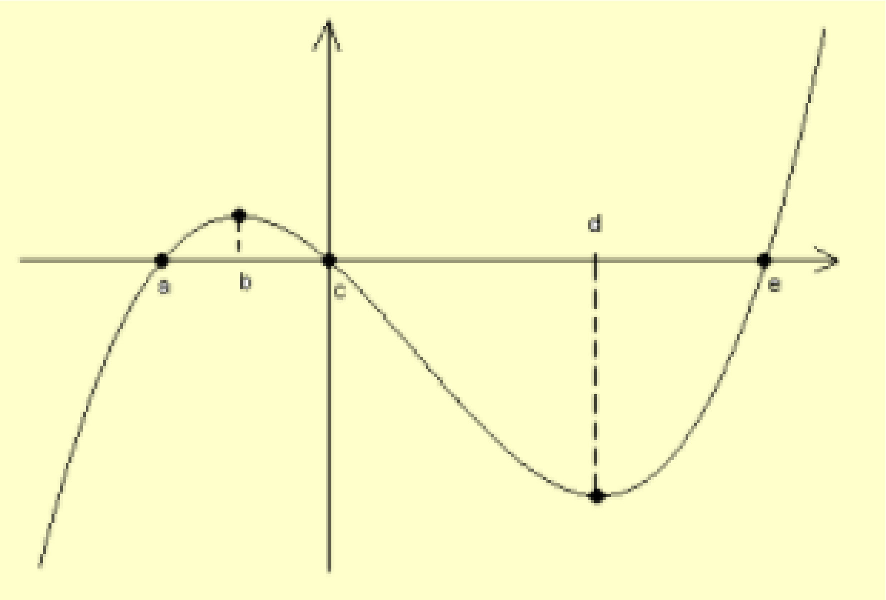
C) 3

D) 4

E) 5

13.

The graph of a polynomial f is shown below. If f' is the first derivative of f, then the remainder of the division of f'(x) by x - b is more likely to be equal to



A) f(b)

B) 1

C) 0

D) 2

E) -1

14.

The set of all points $(\ln(t - 2), 3t)$, where t is a real number greater than 2, is the graph of

A) $y = \ln(x/3 - 2)$

B) $y = 3x$

C) $x = \ln(y - 2)$

D) $y = 3(e^x + 2)$

E) $y = \ln(x)$

15.

Let $P(x) = 2x^3 + Kx + 1$. Find K if the remainder of the division of $P(x)$ by $x - 2$ is equal to 10.

A) -7/2

B) 2/7

C) 7/2

D) -2/7

E) K cannot be determined

16.

Function *f* is defined by

$$\begin{cases} f(x) = \dfrac{\sqrt{4x+4} - \sqrt{2x+4}}{2x} \\ f(0) = C \end{cases}$$

.

where C is a constant. What must the value of C be equal to for function *f* to be continuous at x = 0?

A) 0

B) 1/4

C) 1/8

D) 1

E) Any real number

17.

f and g are functions such that $f'(x) = g(x)$ and $g'(x) = f(x)$. The second derivative of

$(f \cdot g)(x)$ is equal to

A) $f''(x)\, g''(x)$

B) $g'(x)\, g(x) + f(x)\, f'(x)$

C) $4\, g(x)\, f(x)$

D) $2\, g(x)\, f(x)$

E) $g(x)\, f(x)$

18.

The average rate of change of the function f defined by $f(x) = \sin(x) + x$ on the closed interval [0 , pi] is equal to

A) 0

B) 2 pi

C) pi

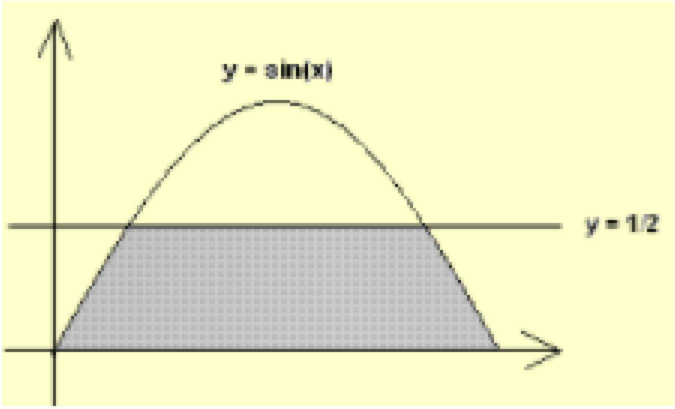
D) 2

E) 1

19.

The figure shows the graphs of y = sin(x) over half a period and the line y = 1/2.

Find area of the shaded region.



.

A) 1

B) 0.5

C) 2 + π/3

D) 2 + π/3 - √3

E) 2 + π/3 + √3

20.

Functions f, g and h are defined as follow: $g(x) = f(x^2)$, $f(x) = h(x^3 + 1)$ and $h'(x) = 2x + 1$. $g'(x) =$

A) $2x^3$

B) $12x^9 + 18x^3$

C) $2x^{11} + 3x^5$

D) $2x^9 + 3x^3$

E) $12x^{11} + 18x^5$