الملف حل أسئلة الاختبار التجريبي نخبة
موقع المناهج ⇦ المناهج الإماراتية ⇦ الصف الحادي عشر المتقدم ⇦ رياضيات ⇦ الفصل الثالث

روابط مواقع التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم			
			
روابط مواد الصف الحادي عشر المتقدم على تلغرام			
التربية الاسلامية	اللغة العربية	اللغة الانجليزية	الرياضيات

المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة رياضيات في الفصل الثالث	
1	أسئلة نموذج تدريبي ريفيل
2	حل مراجعة أسئلة وفق الهيكل الوزاري
3	أسئلة الاختبار التحريبي الأول نخبة
4	حل أسئلة وفق الهيكل الوزاري نخبة
5	مراجعة نهائية مكونة من ثلاثة أجزاء

للتواصل الخاص

Scan me

قناة التليجرام

Scan me

الموقع الالكتروني

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جميع القنوات والجروبات

Q.1: ...

If $\lim_{h\to 0}\frac{\arcsin(a+h)-\arcsin(a)}{h} = 2$, which of the following could be the value of a?

Learning Outcomes Covered

- MAP.FUN-3.E.2

$f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$

$y = \sin^{-1}(a)$

$y' = \frac{1}{\sqrt{1-a^2}} = \frac{2}{1}$

Shift → solve

$a = 0.866$

$a = \frac{\sqrt{3}}{2}$

1. $\frac{\sqrt{2}}{2}$
2. $\frac{\sqrt{3}}{2}$
3. $\sqrt{3}$
4. $\frac{1}{2}$

Mark(s): 0/4

100 km speed

Q.2: ...

For a car driven 100 kilometers at a constant speed, the amount of fuel used as a function of the speed is modeled by a differentiable function F. Fuel is measured in liters, and speed is measured in kilometers per hour (km/hr). In this context, which of the following is a correct interpretation of the statement $F'(50) > F'(80)$?

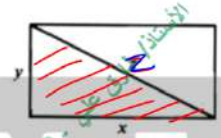
Learning Outcomes Covered

- MAP.CHA-3.A.2

1. Driving at 50 km/hr uses more fuel than driving at 80 km/hr.
2. The rate at which 50 liters of fuel is used is greater than the rate at which 80 liters of fuel is used.
3. The rate of change of the speed is greater when driving at 50 km/hr than when driving at 80 km/hr.
4. The rate of change of liters of fuel used with respect to the speed is greater when driving at 50 km/hr than when driving at 80 km/hr.

Mark(s): 4/4

Q.3: ...



The sides of the rectangle above increase in such a way that $\frac{dx}{dt} = 1$ and $\frac{dz}{dt} = 3\frac{dy}{dt}$. At the instant when $x = 4$ and $y = 3$, what is the value of $\frac{dz}{dt}$?

Learning Outcomes Covered

- MAP.CHA-3.D.1
- MAP.CHA-3.E.1

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

2. 1

3. 2

4. $\sqrt{5}$

Mark(s): 4/4

$z = 1$

$x = 3y \Rightarrow y = \frac{x}{3}$

$z = \sqrt{4^2 + 3^2}$

$z = 5$

$z^2 = x^2 + y^2$

$2zz' = 2xx' + 2yy'$

$2(5)(1) = 2(4)x' + 2(3)\left(\frac{x'}{3}\right)$

$10 = 8x' + 2x'$

$10 = 10x'$

$x' = \frac{10}{10} = 1$

Q.4: ...

A cube with edges of length x centimeters has volume $V(x) = x^3$ cubic centimeters. The volume is increasing at a constant rate of 40 cubic centimeters per minute. At the instant when $x = 2$, what is the rate of change of x, in centimeters per minute, with respect to time?

Learning Outcomes Covered

- MAP.CHA-3.E.1

10/3

$* \quad V = x^3$

$V' = 40 \quad , \quad x = 2$

$x' = ?$

$V' = 3x^2 x'$

$40 = 3(2)^2 x'$

shift → solve.

1. $\sqrt{\frac{40}{3}}$
2. 5
3. 10
4.

Mark(s): 4/4

The radius of a right circular cylinder is increasing at a rate of 2 units per second. The height of the cylinder is decreasing at a rate of 5 units per second. Which of the following expressions gives the rate at which the volume of the cylinder is changing with respect to time in terms of the radius r and height h of the cylinder?

(The volume V of a cylinder with radius r and height h is $V = \pi r^2 h$.)

Learning Outcomes Covered

MAP.CHA-3.D.1

1. $-20\pi r$

2. $2\pi rh$

3. $4\pi rh - 5\pi r^2$

4. $4\pi rh + 5\pi r^2$

Mark(s): 4/4

$r' = 2$, $h' = -5$

$V' = ?$

$V = \pi r^2 h$ — product rule

$V' = \pi(r^2 h' + 2r r' h)$

$V' = \pi(-5r^2 + 2r(2)h)$

$V' = -5\pi r^2 + 4rh\pi$

$= 4\pi rh - 5\pi r^2$

Q.6: ...

If f is continuous for $a \leq x \leq b$ and differentiable for $a<x<b$, which of the following could be false?

Learning Outcomes Covered

- MAP.FUN-1.B.1

1. $f'(c) = \frac{f(b)-f(a)}{b-a}$ for some c such that $a<c<b$.

2. $f'(c)=0$ for some c such that $a<c<b$.

3. f has a minimum value on $a \leq x \leq b$.

4. f has a maximum value on $a \leq x \leq b$.

Mark(s): 4/4

Q.7: ...

If $x^2+y^2=25$, what is the value of $\frac{d^2y}{dx^2}$ at the point (4,3) ?

Learning Outcomes Covered

- MAP.FUN-3.D.1
- MAP.FUN-3.F.1

1. $-\frac{25}{27}$
2. $-\frac{7}{27}$
3. $\frac{7}{27}$
4. $\frac{3}{4}$

$2x + 2y\,y' = 0$

$2(4) + 2(3)\,y' = 0$

Shift → Solve

$y' = -\frac{4}{3}$

$2 + 2y'y' + 2y''y = 0$

$2 + 2(3)\,y'' + 2\left(-\frac{4}{3}\right)^2 = 0$

Shift → Solve.

Mark(s): 4/4

Q.8: ...

If $P(t)$ is the size of a population at time t, which of the following differential equations describes linear growth in the size of the population?

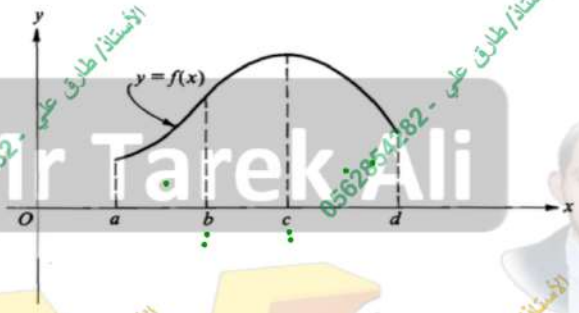
Learning Outcomes Covered

- MAP.CHA-3.C.1

1. $\frac{dP}{dt} = 200$
2. $\frac{dP}{dt} = 200t$
3. $\frac{dP}{dt} = 100t^2$
4. $\frac{dP}{dt} = 200P$

Mark(s): 4/4

Q.9: ...



The graph of $y = f(x)$ is shown in the figure above. On which of the following intervals are $\frac{dy}{dx} > 0$ and $\frac{d^2y}{dx^2} < 0$?

I.a<x<b

II.b<x<c

III.c<x<d

Learning Outcomes Covered

- MAP.FUN-4.A.1
- MAP.FUN-4.A.4

1. I only
2. II only
3. III only
4. I and II

Mark(s): 4/4

Q.10: ...

x	10	11	12	13	14
$f(x)$	5	2	3	6	5

The table above gives values of the continuous function f at selected values of x. If f has exactly two critical points on the open interval (10, 14), which of the following must be true?

Learning Outcomes Covered

- Justify conclusions about functions by applying the Extreme Value Theorem.

1. $f(x) > 0$ for all x in the open interval (10, 14).
2. $f'(x)$ exists for all x in the open interval (10, 14).
3. $f'(x) < 0$ for all x in the open interval (10, 11).
4. $f'(12) \neq 0$

Mark(s): 4/4

Q.11: ...

Let f be a function defined and continuous on the closed interval [a,b]. If f has a relative maximum at c and $a<c<b$, which of the following statements must be true?

I. $f(c)$ exists.

II. If $f(c)$ exists, then $f'(c)=0$

III. If $f(c)$ exists, then $f''(c) \leq 0$.

Learning Outcomes Covered

- MAP.FUN-4.A.7

1. III only
2. I and II only
3. I and III only
4. II and III only

Mark(s): 4/4

$A = l \cdot w$

Q.12: ...

$y = 0$

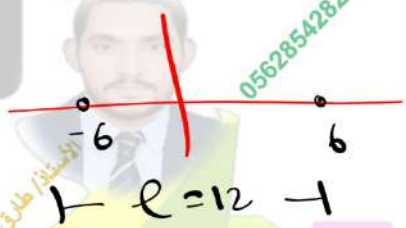
A rectangle has its upper two vertices on the graph of $y = 12 - \frac{x^2}{3}$ and its lower two vertices on the x-axis. What is the maximum possible area of the rectangle?

Learning Outcomes Covered

- MAP.FUN-4.B.1

$y = 0$

$x = 6, \ -6$



$l = 12$

1. $216 - 72\sqrt{5}$

2. $32\sqrt{3}$

3. 96

4. 144

Mark(s): 4/4

$x = 8$
$y = 2$

Q.13: ...

Let $y = f(x)$ be a differentiable function such that $\frac{dy}{dx} = \frac{x}{y}$ and $f(8) = 2$. What is the approximation of $f(8.1)$ using the line tangent to the graph of f at $x = 8$?

Learning Outcomes Covered

- MAP.CHA-3.F.1

$y - y_1 = m(x - x_1)$

$m = \frac{8}{2} = 4$

$y - 2 = 4(x - 8)$

$y = 4x - 32 + 2$

$y = 4x - 30$

$f(8.1) = 4(8.1) - 30$

$= 2.4$.

1. 0.4
2. 2.025
3. 2.4
4. 6

Mark(s): 4/4

Q.14: ...

If $f(x) = \cos x$ and $g(x) = 1$ for all x, and if $f(0) = g(0) = 0$, then $\lim_{x \to 0} \frac{f(x)}{g(x)}$ is

Learning Outcomes Covered

- MAP.LIM-4.A.2

$\lim_{x \to 0} \frac{\cos x}{1}$

$\lim_{x \to 0} \cos x$

$\cos 0$

$= 1$

1. -1
2. 0
3. 1
4. $\frac{\pi}{2}$

Mark(s): 4/4

Q.15: ...

$$f(x) = \begin{cases} -x^2 + 3 & \text{if } x \leq 5 \\ -10x + 28 & \text{if } x > 5 \end{cases}$$

Let f be the function defined above. Which of the following statements about f is true?

Learning Outcomes Covered

- MAP.FUN-1.B.1

1. f is continuous and differentiable at $x = 5$.
2. f is continuous but not differentiable at $x = 5$.
3. f is differentiable but not continuous at $x = 5$.
4. f is defined but neither continuous nor differentiable at $x = 5$.

Mark(s): 4/4

Q.16: ...

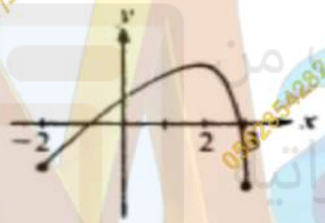
Let f be a function that is continuous on the closed interval $[-2,3]$ such that $f(0)$ does not exist, $f(2) = 0$, and $f'(x) < 0$ for all x except $x = 0$. Which of the following could be the graph of f?

Learning Outcomes Covered

- MAP.FUN-4.A.10

1.

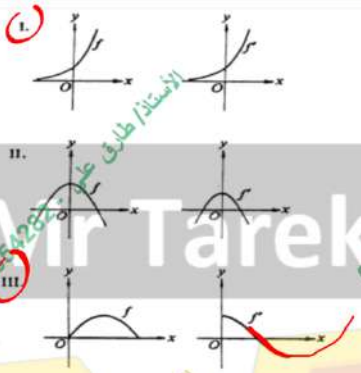
2.



3.

4.

Mark(s): 0/4



Which of the following pairs of graphs could represent the graph of a function and the graph of its derivative?

Learning Outcomes Covered

- MAP.FUN-4.A.11

1. II only
2. III only
3. II and III
4. I and III

Mark(s): 0/4

$V = 16\pi$

Q.18: ...

The volume of a cylindrical tin can with a top and a bottom is to be 16π cubic inches. If a minimum amount of tin is to be used to construct the can, what must be the height, in inches, of the can?

Learning Outcomes Covered

- MAP.FUN-4.C.1

$V = \pi r^2 h$

$16\pi = \pi r^2 h$

$16 = r^2 h$

$h = \frac{16}{r^2}$

1. $2\sqrt[3]{2}$
2. $2\sqrt{2}$
3. $2\sqrt[3]{4}$
4. 4

$h = \frac{16}{2^2} = \frac{16}{4} = 4$

Mark(s): 0/4

Q.19: ...

Let f be a differentiable function such that $f(3) = 15$, $f(6) = 3$, $f'(3) = -8$, and $f'(6) = -2$. The function g is differentiable and $g(x) = f^{-1}(x)$ for all x. What is the value of $g'(3)$?

Learning Outcomes Covered

- MAP.FUN-3.E.1

1. $-\frac{1}{2}$
2. $-\frac{1}{8}$
3. $\frac{1}{6}$
4. $\frac{1}{3}$

Mark(s): 4/4

Q.20: ...

If $y=\sin x$ and $y^{(n)}$ means the nth derivative of y with respect to x then the smallest positive integer n for which $y^{(n)}=y$ is

Learning Outcomes Covered

MAP.FUN-3.F.1

2

1.

4

2.

5

3.

6

4.

Mark(s): 4/4

$y = y$

$y' = \cos x$

$y'' = -\sin x$

$y''' = -\cos x$

$y^{(4)} = -(-\sin x)$

$= \sin x = y$

Q.21: ...

If a and b are positive constants, then $\lim_{x\to\infty} \frac{\ln(bx+1)}{\ln(ax^2+3)} =$

Learning Outcomes Covered

- MAP.LIM-4.A.2

1. 0
2. $\frac{1}{2}$
3. 2
4. ∞

$$\lim_{x\to\infty} \frac{\frac{1}{bx+1}\cdot b}{\frac{1}{ax^2+3}\cdot 2ax}$$

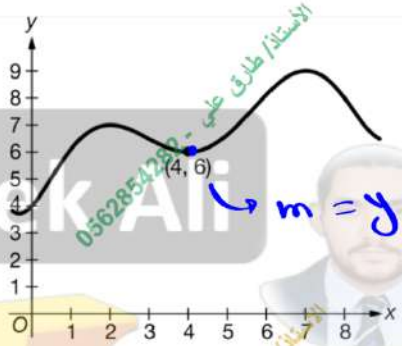
$$\lim_{x\to\infty} \frac{(ax^2+3)(b)}{(bx+1)(2ax)}$$

$$= \frac{abx^2+3b}{2abx^2+2ax}$$

$$\frac{ab}{2ab} = \frac{1}{2}$$

Mark(s): 4/4

Q.22: ...



The graph of f', the derivative of the function f, is shown above. If $f(4) = -1$, what is the approximation for $f(4.5)$ using the line tangent to the graph of f at $x = 4$?

Learning Outcomes Covered

- MAP.CHA-3.F.1

1. -4

2. -1

3. 2

4. 6

Mark(s): 0/4

$m = y = 6$

$x = 4, \; y = -1$

$y - y_1 = m(x - x_1)$

$y + 1 = 6(x - 4)$

$y + 1 = 6x - 24$

$y = 6x - 24 - 1$

$y = 6x - 25$

$f(4.5) = 6(4.5) - 25$

$= 2$

Q.23: ...

If $f'(x)$ and $g'(x)$ exist and $f'(x) > g'(x)$ for all real x, then the graph of $y = f(x)$ and the graph of $y = g(x)$

Learning Outcomes Covered

- MAP.FUN-4.A.1

1. intersect exactly once.

2. intersect no more than once.

3. do not intersect.

4. could intersect more than once.

Mark(s): 4/4

The function f has a first derivative given by $f'(x) = x(x-3)^2(x+1)$. At what values of x does f have a relative maximum?

Learning Outcomes Covered

- MAP.FUN-4.A.2

1. -1 only
2. 0 only
3. -1 and 0 only
4. -1 and 3 only

Mark(s): 4/4

Q.25: ...

The point on the curve $x^2 + 2y = 0$ that is nearest the point $(0, -1/2)$ occurs where y is

Learning Outcomes Covered

- MAP.CHA-3.E.1
- MAP.FUN-4.A.3

$2y = -x^2$

$y = -\frac{x^2}{2}$.

$x = 0$

$y = 0$

1. 1/2
2. 0
3. −1/2
4. -1

Mark(s): 4/4

Q.26: ...

If the graph of $y = x^3 + ax^2 + bx - 4$ has a point of inflection at (1, -6), what is the value of b?

Learning Outcomes Covered

- MAP.FUN-4.A.6

1. -3
2. 0
3. 1
4. 3

Mark(s): 0/4

$y' = 3x^2 + 2ax + b$

$y'' = 6x + 2a = 0$

$6(1) + 2a = 0$

$a = -3$

$y = x^3 - 3x^2 + bx - 4$

$(1, -6)$

$-6 = 1 - 3 + b - 4$

Shift → solve

$b = 0$

Q.27: ...

Let g be a twice-differentiable function with $g'(x) > 0$ and $g''(x) > 0$ for all real numbers x, such that $g(4) = 12$ and $g(5) = 18$ Of the following, which is a possible value for $g(6)$?

Learning Outcomes Covered

- MAP.FUN-4.A.1

18

1. 21
2. 24
3. 27
4.

Mark(s): 4/4

$$\frac{f(b)-f(a)}{b-a} = \frac{18-12}{5-4} = \frac{6}{1} = 6$$

$$* \; 6 = \frac{x-18}{6-5} \Rightarrow 6 = x-18$$

$$x = 18+6$$

$$x = 24$$

twice differen

$$n+1 = 2+1 = 3 \quad +24$$

$$= 27$$

Q.28: ...

The points $(-1, -1)$ and $(1, -5)$ are on graph of a function $y = f(x)$ that satisfies the differential equation $\frac{dy}{dx} = x^2 + y$. Which of the following must be true?

Learning Outcomes Covered

MAP.FUN-3.D.1

1. $(1, -5)$ is a local maximum of f.

2. $(1, -5)$ is a point of inflection of the graph of f.

3. $(-1, -1)$ is a local maximum of f.

4. $(-1, -1)$ is a local minimum of f.

Mark(s): 4/4

Q.29: ...

The equation $y = 2e^{6x} - 5$ is a particular solution to which of the following differential equations?

Learning Outcomes Covered

- MAP.CHA-3.B.1

$y' = 12e^{6x}$

1. $y' - 6y - 30 = 0$

$12e^{6x} - 12e^{6x} + 30 - 30 = 0$

2. $2y' - 12y + 5 = 0$

3. $y'' - 5y' - 6y = 0$

4. $y'' - 2y' + y + 5 = 0$

Mark(s): 0/4

Q.30: ...

Let f be the function given by $f(x) = x^3 - 2x^2 + 5x - 16$. For what value of x in the closed interval [0,5] does the instantaneous rate of change of f equal the average rate of change of f over that interval?

Learning Outcomes Covered

- MAP.FUN-1.B.1

Mean value Theorem

$f'(x) = 3x^2 - 4x + 5$

$\frac{f(5) - f(0)}{5 - 0} = \frac{84 - (-16)}{5} = 20$

$3x^2 - 4x + 5 = 20$

$3x^2 - 4x + 5 - 20 = 0$

$3x^2 - 4x - 15 = 0$

$x = 3 \in [0,5]$ ✓

$x = -\frac{5}{3} \notin [0,5]$

1. 0
2. 5/3
3. 5/2
4. 3

A particle moves along the x-axis so that at time $t \geq 0$ its position is given by $x(t) = 2t^3 - 21t^2 + 72t - 53$. At what time t is the particle at rest?

(A) $t = 1$ only
(B) $t = 3$ only
(C) $t = 7/2$ only
(D) $t = 3$ and $t = 7/2$
(E) $t = 3$ and $t = 4$

$x' = 6t^2 - 42t + 72 = 0$

$t = 3 , t = 4$

The absolute maximum values of $f(x) = x^3 - 3x^2 + 12$ on the closed interval $[-2, 4]$ occurs at $x =$

(A) 4
(B) 2
(C) 1
(D) 0
(E) -2

$f'(x) = 3x^2 - 6x = 0$

$x = 0 , x = 2$

$f(0) = 0^3 - 3(0)^2 + 12 = 12$

$f(2) = 2^3 - 3(2)^2 + 12 = 8$

$f(-2) = (-2)^3 - 3(-4)^2 + 12 = -8$

$f(4) = 4^3 - 3(4)^2 + 12 = 28$ Maximum

Let f be the function given by $f(x) = x^3 - 6x^2$. The graph of f is concave up when

(A) $x > 2$ ✓

(B) $x < 2$

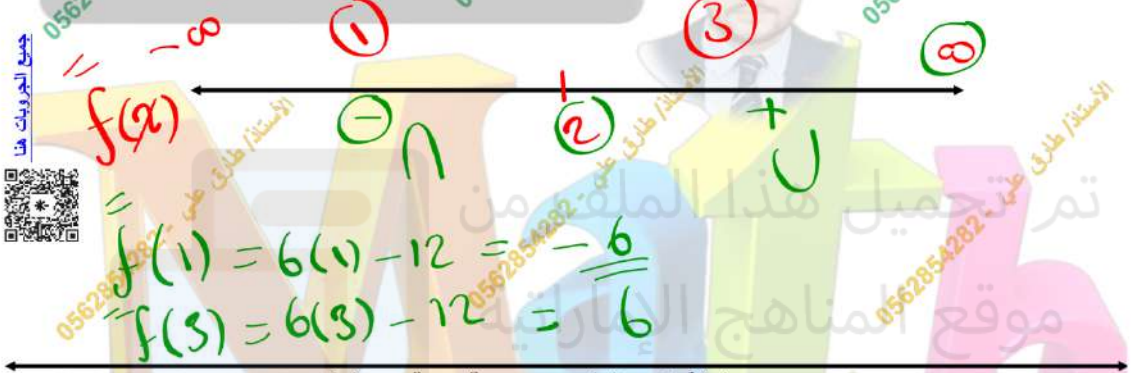
(C) $0 < x < 4$

(D) $x < 0$ or $x > 4$ only

(E) $x > 6$ only

$f' = 3x^2 - 12x$

$f'' = 6x - 12 = 0 \rightarrow x = 2$



Let f be the function defined by $f(x) = x^3 + x^2 + x$. Let $g(x) = f^{-1}(x)$, where g(3) = 1. What is the value of g'(3)?

(A) 1/39

(B) 1/34

(C) 1/6 ✓

(D) 1/3

(E) 39

$g'(3) = \frac{1}{f'(f^{-1}(3))}$

$g'(3) = \frac{1}{f'(1)}$

$f'(1) = 3x^2 + 2x + 1 = 3(1)^2 + 2(1) + 1$

$f'(1) = 6$

$g'(3) = \frac{1}{6}$

If $P(t)$ is the size of a population at time t, which of the following differential equations describes linear growth in the size of the population?

(A) $\frac{dP}{dt} = 200$ ✓

(B) $\frac{dP}{dt} = 200t$

(C) $\frac{dP}{dt} = 100t^2$

(D) $\frac{dP}{dt} = 200P$

(E) $\frac{dP}{dt} = 200P^2$

The position of a particle moving along a straight line at any time t is given by $s(t) = t^2 + 4t - 4$. What is the acceleration of the particle when $t = 4$?

(A) 0

(B) 2 ✓

(C) 4

(D) 8

(E) 12

$s' = 2t + 4$

$s'' = 2$

The function f given by $f(x) = 3x^5 - 4x^3 - 3x$ has a relative maximum at $x=$

(A) -1 ✓

(B) $-\frac{\sqrt{5}}{5}$

(C) 0

(D) $\frac{\sqrt{5}}{5}$

(E) 1

$f(x) = 15x^4 - 12x^2 - 3 = 0$

$x = 1 \quad x = -1$

$\lim_{x \to 0} \frac{x^2}{1-\cos x}$ is

$\to 0.001$

(A) -2

(B) 0

(C) 1

(D) 2 ✓

(E) nonexistent

If $f(x) = (2x+1)^4$, then the 4th derivative of $f(x)$ at $x = 0$ is

(A) 0
(B) 24
(C) 48
(D) 240
(E) 384

$f' = 4(2x+1)^3 \cdot 2 = 8(2x+1)^3$

$f'' = 24(2x+1)^2 \cdot 2$

$= 48(2x+1)^2$

$f''' = 96(2x+1) \cdot 2 = 192(2x+1)$

$f^{(4)} = 192 \cdot 2 = \boxed{384}$

$$\lim_{x \to \infty} \frac{\ln(e^{3x}+x)}{x} =$$

$x = 50$

(A) 0
(B) 1
(C) 3
(D) ∞

If $y = xy + x^2 + 1$, then when x=-1, $\frac{dy}{dx}$ is

(A) $\frac{1}{2}$

(B) $-\frac{1}{2}$ ✓

(C) -1

(D) -2

(E) nonexistent

$x = -1 \quad , \quad y = 1$

$y = y + xy' + 2x$

$y' - xy' = 2x + y$

$y'(1 - x) = 2x + y$

$y' = \frac{2x+y}{1-x} \rightarrow y' = \frac{-2+y}{1+1} = \frac{-2+y}{2}$

$\frac{-2+1}{2} = \boxed{\frac{-1}{2}}$

If $3x^2 + 2xy + y^2 = 2$, then the value of dy/dx at x = 1 is

(A) -2

(B) 0

(C) 2

(D) 4

(E) not defined ✓

$6x + 2y + 2xy' + 2yy' = 0$

$y'(2x + 2y) = -6x - 2y$

$y' = \frac{-6x - 2y}{2x + 2y}$

$y' = \frac{-6(1) - 2(-1)}{2(1) + 2(-1)}$

$= 0$

Math error

$= \boxed{\frac{-4}{0}}$

$x = 1$

$3(1)^2 + 2(1)y + y^2 = 2$

$\boxed{y = -1}$

What is the slope of the line tangent to the curve $3y^2 - 2x^2 = 6 - 2xy$ at the point (3,2)?

(A) 0

(B) 4/9

(C) 7/9

(D) 6/7

(E) 5/3

$6yy' - 4x = 0 - (2y + 2xy')$

$6yy' - 4x = -2y - 2xy'$

$6(2)y' - 4(3) = -2(2) - 2(3)y'$

$12y' - 12 = -4 - 6y' \Rightarrow 18y' = 8$

$y' = \frac{8}{18} = \boxed{\frac{4}{9}}$.

Let f be the function given by $f(x) = 300x - x^3$. On which of the following intervals is the function f increasing?

(A) $(-\infty, 10]$ and $[10, \infty)$

(B) $[-10, 10]$

(C) $[0, 10]$ only

(D) $[0, 10\sqrt{3}]$ only

(E) $[0, \infty)$

$f'(x) = 300 - 3x^2 = 0$

$= -3x^2 + 300 = 0$

$x = 10$, $x = -10$

	$-\infty$		-10		10		∞
$f'(x)$	$-$		0	$+$	0	$-$	

increasing $[-10, 10]$.

For what values of x does the graph of $y = 3x^5 + 10x^4$ have a point of inflection?

(A) $x = -\frac{8}{3}$ only

(B) $x = -2$ only

(C) $x = 0$ only

(D) $x = 0$ and $x = -\frac{8}{3}$

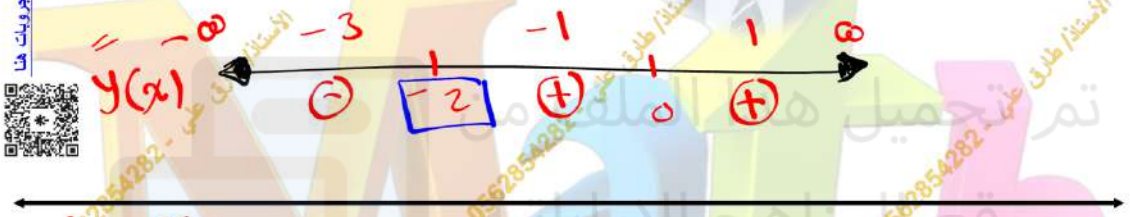
(E) $x = 0$ and $x = -2$

second

$y' = 15x^4 + 40x^3$

$y'' = 60x^3 + 120x^2 = 0$

$x = 0$ / $x = -2$



If $\sin(xy) = x$, then $\frac{dy}{dx} =$

(A) $\frac{1}{\cos(xy)}$

(B) $\frac{1}{x\cos(xy)}$

(C) $\frac{1-\cos(xy)}{\cos(xy)}$

(D) $\frac{1-y\cos(xy)}{x\cos(xy)}$

(E) $\frac{y(1-\cos(xy))}{x}$

$\cos(xy) \cdot (y + xy') = 1$

$y\cos xy + xy'\cos xy = 1$

$xy'\cos xy = 1 - y\cos xy$

$y' = \frac{1 - y\cos xy}{x\cos xy}$

If $f(x) = x + \frac{1}{x}$, then the set of values for which f increases is

(A) $(-\infty, -1] \cup [1, \infty)$

(B) $[-1, 1]$

(C) $(-\infty, \infty)$

(D) $(0, \infty)$

(E) $(-\infty, 0) \cup (0, \infty)$

$\lim_{x \to 0} \frac{e^x - 1}{x}$ is

(A) ∞

(B) e - 1

(C) 1

(D) 0

(E) e^x

$\lim_{\theta \to 0} \frac{1 - \cos\theta}{2\sin^2\theta}$

(A) 0

(B) 1/8

(C) 1/4

(D) 1

(E) nonexistent

$a=0$
$b=2$

If c is the number that satisfies the conclusion of the Mean Value Theorem for $f(x) = x^3 - 2x^2$ on the interval $0 \le x \le 2$, then $c =$

(A) 0
(B) 1/2
(C) 1
(D) 4/3
(E) 2

$\bar{f}(x) = \frac{F(b) - F(a)}{b - a}$

$3x^2 - 4x = \frac{F(2) - F(0)}{2 - 0}$

$3x^2 - 4x = \frac{0 - 0}{2}$

$3x^2 - 4x = 0$

$x = 0$ / $x = \frac{4}{3}$

What is the slope of the line tangent to the curve $x^2y + y^2 = 21$ at the point $(2, 3)$?

(A) $-\frac{9}{2}$
(B) 2
(C) $-\frac{6}{5}$
(D) $\frac{9}{10}$

f

$2x \cdot y$

$2xy + x^2 y' + 2y y' = 0$

$2(2)(3) + 2^2 y' + 2(3) y' = 0$

$y' = -1.2$

The radius of a circle is increasing at a constant rate of 0.5 meter per second. What is the rate of increase in the circumference of the circle at the instant when the radius of the circle is 3 meters?

(A) 0.5 m/sec
(B) 1.5 m/sec
(C) π m/sec
(D) 3π m/sec

$r = 0.5$, $C = ??$, $r = 3$

$C = 2\pi r$

$C = 2\pi r$

$C = 2\pi (0.5)$

$\Rightarrow C = \pi$

A spherical snowball is melting in such a way that it maintains its shape. The volume of the snowball is decreasing at a constant rate of 5 cubic inches per minute. At the instant when the radius of the snowball is decreasing at a rate of $\frac{3}{5}$ inch per minute, what is the radius of the snowball, in inches? (The volume V of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.)

(A) $\sqrt{\frac{5}{4\pi}}$
(B) $\frac{25}{12\pi}$
(C) $\frac{5}{\sqrt{12\pi}}$
(D) $\frac{125}{36\pi}$

$\dot{V} = -5$, $\dot{r} = -\frac{3}{5}$, $r = ??$

$V = \frac{4}{3}\pi r^3$

$\dot{V} = \frac{4}{3}\pi \cdot 3r^2 \dot{r}$

$-5 = 4\pi \left(-\frac{3}{5}\right) r^2$

$\frac{-5}{4\pi\left(-\frac{3}{5}\right)} = r^2 \rightarrow r = \sqrt{\frac{-5}{4\pi\left(-\frac{3}{5}\right)}}$ shift → solve

$r = 0.81$

Let f be a function with $f(3) = -7$ and $f'(3) = 5$. What is the approximation of $f(2.8)$ obtained by using the line tangent to the graph of f at $x = 3$?

(A) -8
(B) -6
(C) 4
(D) 6

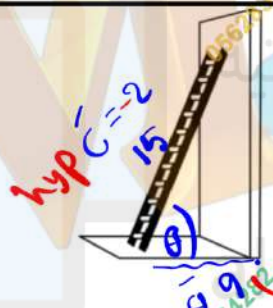
$y - y_1 = m(x - x_1)$

$y + 7 = 5(x - 3)$

$y + 7 = 5x - 15$

$y = 5x - 15 - 7 \rightarrow \boxed{y = 5x - 22}$

$f(2.8) = 5(2.8) - 22 = \boxed{-8}$



$\cos\theta = \frac{9}{-2}$

$\theta = -\frac{2}{9}$

The top of a 15-foot-long ladder rests against a vertical wall with the bottom of the ladder on level ground, as shown above. The ladder is sliding down the wall at a constant rate of 2 feet per second. At what rate, in radians per second, is the acute angle between the bottom of the ladder and the ground changing at the instant the bottom of the ladder is 9 feet from the base of the wall?

(A) $-\frac{2}{9}$
(B) $-\frac{1}{6}$
(C) $-\frac{2}{25}$
(D) $\frac{2}{25}$
(E) $\frac{1}{9}$

What is the minimum value of $f(x) = x\ln(x)$?

(A) -e

(B) -1

(C) $-\frac{1}{e}$

(D) 0

(E) has no minimum value

$f'(x) = x \cdot \frac{1}{x} + \ln x$

$f'(x) = 1 + \ln x = 0$

$\ln x = -1$

$e^{\ln x} = e^{-1}$

$x = e^{-1} = \left|\frac{-1}{e}\right|$