

1. The position of a vehicle moving on a straight track along the  $x$ -axis is given by the equation  $x(t) = 3t^3 - 2t^2 + t$ , where  $x$  is in meters and  $t$  is in seconds. What is its velocity at time  $t = 3$  s?

- 1) 47 m/s
- 2) 50 m/s
- 3) 60 m/s
- 4) 66 m/s
- 5) 70 m/s

2. The velocity of a car traveling on a straight track along the  $y$ -axis is given by the equation  $v(t) = -12t^2 + 6t + 2$ , where  $v$  is in meters per second and  $t$  is in seconds. The vehicle's initial position is  $y = -1$  m. At which one of the following times is the car at the origin?

- 1) Zero
- 2) 1 s
- 3) 2 s
- 4) 3 s
- 5) 4 s

3. The position of a vehicle moving on a straight track along the  $x$ -axis is given by the equation  $x(t) = t^2 + 3t + 5$ , where  $x$  is in meters and  $t$  is in seconds. What is its acceleration at time  $t = 5$  s?

- 1) Zero
- 2)  $2 \text{ m/s}^2$
- 3)  $5 \text{ m/s}^2$
- 4)  $10 \text{ m/s}^2$
- 5)  $13 \text{ m/s}^2$

4. The equation  $v(t) = 3t^2 - 4t + 2$ , where  $v$  is in meters per second and  $t$  is in seconds; gives the velocity of a vehicle moving along a straight track. The vehicle's initial position is 3 m. What is the vehicle's position at  $t = 4$  s?

- 1) 40 m
- 2) 41 m
- 3) 42 m
- 4) 43 m
- 5) 44 m

5. The acceleration of a car traveling on a straight track along the  $y$ -axis is given by the equation  $a = 5 \text{ m/s}^2$ , where  $a$  is in meters per second squared. If at  $t = 0$  s the car's velocity is 3 m/s, what is its velocity at  $t = 2$  s?

- 1) 3 m/s
- 2) 5 m/s
- 3) 10 m/s
- 4) 13 m/s
- 5) 15 m/s

6. The acceleration of a car traveling on a straight track along the  $x$ -axis is given by the equation  $a(t) = 2t + 1$ , where  $a$  is in meters per second squared and  $t$  is in seconds. If  $x(0) = 0$  and  $v(0) = 0$ , what is the car's displacement at  $t = 3$ ?

- 1) 1 m
- 2) 7 m
- 3) 9 m
- 4) 12 m
- 5) 13.5 m

7. The velocity of a car traveling along the  $y$ -axis is given by the equation  $v(t) = 2t^2 - 8t + 9$ , where  $v$  is in meters per second and  $t$  is in seconds. At what time is the car's instantaneous acceleration equal to zero?

- 1) Zero
- 2) 1 s
- 3) 2 s
- 4) 3 s
- 5) 4 s

8. The equation of the position of an object moving along the  $x$ -axis is given by  $x(t) = 1.5t^3 - 4.5t^2 + .5t$ , where  $x$  is in meters and  $t$  is in seconds. What is the object's displacement when its instantaneous acceleration is equal to zero?

- 1) Zero
- 2)  $-2.5$  m
- 3) 3 m
- 4)  $-12$  m
- 5) 12 m

9. An object moves along the  $x$ -axis with a velocity  $v(t) = 3t^2 - 2t - 3$ , where  $v$  is in m/s and  $t$  is in seconds. What is the total distance traveled during the time interval  $2 < t < 5$  s?

- 1) 80 m
- 2) 83 m
- 3) 85 m
- 4) 87 m
- 5) 90 m

10. The velocity of a particle moving along the  $x$ -axis is given by the equation  $v(t) = 5 + 3t^2$ , where  $v$  is in m/s and  $t$  is in seconds. What is the average velocity during the interval  $t = 0$  to  $t = 3$ ?

- 1) 12 m/s
- 2) 14 m/s
- 3) 28 m/s
- 4) 31 m/s
- 5) 42 m/s

11. The velocity of a particle moving along the  $x$ -axis is given by the equation  $v(t) = 1 + 5t + 2t^2$ , where  $v$  is in m/s and  $t$  is in seconds. What is the average acceleration during the interval  $t = 0$  to  $t = 2$ ?

- 1)  $9 \text{ m/s}^2$
- 2)  $10 \text{ m/s}^2$
- 3)  $13 \text{ m/s}^2$
- 4)  $18 \text{ m/s}^2$
- 5)  $19 \text{ m/s}^2$

12. The position of a particle moving along the  $x$ -axis is given by the equation  $x(t) = 1 + 2t^2 + 3t^3$ , where  $x$  is in meters and  $t$  is in seconds. What is the average acceleration during the interval  $t = 0$  to  $t = 1$ ?

- 1)  $6 \text{ m/s}^2$
- 2)  $9 \text{ m/s}^2$
- 3)  $13 \text{ m/s}^2$
- 4)  $18 \text{ m/s}^2$
- 5)  $22 \text{ m/s}^2$

13. The position of a particle moving along the  $x$ -axis is given by the equation  $x(t) = 2 + 6t^2$ , where  $x$  is in meters and  $t$  is in seconds. What is the average velocity during the interval  $t = 0$  to  $t = 0.5$ ?

- 1) 2 m/s
- 2) 3 m/s
- 3) 4 m/s
- 4) 5 m/s
- 5) 6 m/s

14. An object's motion is given by the equation  $x(t) = 2 + 4t^3$ . What is the equation for the object's velocity?

- 1)  $v(t) = 2t + 12t^2$
- 2)  $v(t) = 4t^2$
- 3)  $v(t) = 2/t + 4t^2$
- 4)  $v(t) = 2t + t^4$
- 5)  $v(t) = 12t^2$

15. An object's motion is given by the equation  $x(t) = 4t + 4t^3$ . What is the equation for the object's acceleration?

- 1)  $a(t) = 24t$
- 2)  $a(t) = 24t + 4$
- 3)  $a(t) = t^4 + 2t^2$
- 4)  $a(t) = 4t^2 + 4$
- 5)  $a(t) = 12t^2 + 4$

16. A truck moving along a straight road at 30 m/s applies its breaks such that its velocity is given by the equation  $v(t) = 30 - 2t$ , where  $v$  is in m/s and  $t$  is in seconds. What is the truck's acceleration at  $t = 1$  s?

- 1)  $-30 \text{ m/s}^2$
- 2)  $-2 \text{ m/s}^2$
- 3)  $2 \text{ m/s}^2$
- 4)  $15 \text{ m/s}^2$
- 5)  $30 \text{ m/s}^2$

17. The equation for the position  $x$  of a particle whose acceleration is given by the equation  $a(t) = 6t - 3$  and starts at rest from the origin is

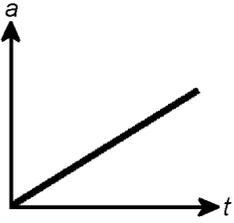
- 1)  $x(t) = 3t^2 - 3t$
- 2)  $x(t) = 6t^2 - 3t$
- 3)  $x(t) = t^3 - 3t^2/2$
- 4)  $x(t) = 6t^3 - 3t$
- 5)  $x(t) = 3t^3 - t$

18. What is the change in velocity in the interval  $t = 0$  to  $t = \frac{\pi}{2}$  of an object whose acceleration is given by  $a(t) = \cos 2t$ ?

- 1) 0 m/s
- 2) 0.5 m/s
- 3) 1 m/s
- 4)  $-0.5 \text{ m/s}$
- 5)  $-1 \text{ m/s}$

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19. The graph of the acceleration of an object is shown below.



The highest order term in the equation for the position of this object has what sign and what exponent of  $t$ ?

- 1) + 1
- 2) - 1
- 3) + 2
- 4) - 2
- 5) + 3

**Answer Key**  
**[New Exam]**

1. 5

2. 2

3. 2

4. 4

5. 4

6. 5

7. 3

8. 2

9. 4

10. 2

11. 1

12. 3

13. 2

14. 5

15. 1

16. 2

17. 3

18. 1

19. 5

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