Calculus Practice: Rectilinear Motion 3b

A particle moves along a coordinate line. Its velocity function is $v(t)$ for $t \geq 0$. For each problem, find the displacement of the particle and the distance traveled by the particle over the given interval.

1) $v(t) = -4t^3 + 27t^2;\ 4 \leq t \leq 12$

2) $v(t) = 2t - 26;\ 11 \leq t \leq 15$

3) $v(t) = -3t^2 + 60t - 225;\ 3 \leq t \leq 10$

4) $v(t) = 3t^2 - 30t;\ 5 \leq t \leq 14$

5) $v(t) = -4t^3 + 24t^2;\ 4 \leq t \leq 9$

6) $v(t) = -3t^2 + 44t - 121;\ 3 \leq t \leq 9$

7) $v(t) = 3t^2 - 22t;\ 3 \leq t \leq 9$

8) $v(t) = 4t^3 - 42t^2;\ 5 \leq t \leq 15$

9) $v(t) = 4t^3 - 33t^2;\ 8 \leq t \leq 11$

10) $v(t) = 2t - 10;\ 2 \leq t \leq 6$

A particle moves along a coordinate line. Its acceleration function is $a(t)$ for $t \geq 0$. For each problem, find the displacement of the particle and the distance traveled by the particle over the given interval.

11) $a(t) = 2;\ v(0) = 0;\ 0 \leq t \leq 9$

12) $a(t) = -6t + 28;\ v(0) = 0;\ 8 \leq t \leq 10$

13) $a(t) = -6t + 56;\ v(0) = -196;\ 3 \leq t \leq 10$

14) $a(t) = 2;\ v(0) = -6;\ 0 \leq t \leq 9$

15) $a(t) = 6t - 44;\ v(0) = 121;\ 0 \leq t \leq 5$

16) $a(t) = 12t^2 - 90t;\ v(0) = 0;\ 7 \leq t \leq 13$

17) $a(t) = 2;\ v(0) = -7;\ 1 \leq t \leq 5$

18) $a(t) = 12t^2 - 84t;\ v(0) = 0;\ 6 \leq t \leq 16$

19) $a(t) = -6t + 16;\ v(0) = 0;\ 5 \leq t \leq 8$

20) $a(t) = 12t^2 - 66t;\ v(0) = 0;\ 2 \leq t \leq 11$

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1) $v(t) = -4t^3 + 27t^2;\ 4 \leq t \leq 12$

Displacement: –5504

Distance traveled: $\frac{799739}{128} \approx 6247.961$

2) $v(t) = 2t - 26;\ 11 \leq t \leq 15$

Displacement: 0

Distance traveled: 8

3) $v(t) = -3t^2 + 60t - 225;\ 3 \leq t \leq 10$

Displacement: 182

Distance traveled: 318

4) $v(t) = 3t^2 - 30t;\ 5 \leq t \leq 14$

Displacement: 54

Distance traveled: 554

5) $v(t) = -4t^3 + 24t^2;\ 4 \leq t \leq 9$

Displacement: –985

Distance traveled: 1337

6) $v(t) = -3t^2 + 44t - 121;\ 3 \leq t \leq 9$

Displacement: 156

Distance traveled: $\frac{4492}{27} \approx 166.37$

7) $v(t) = 3t^2 - 22t;\ 3 \leq t \leq 9$

Displacement: –90

Distance traveled: $\frac{4330}{27} \approx 160.37$

8) $v(t) = 4t^3 - 42t^2;\ 5 \leq t \leq 15$

Displacement: 4500

Distance traveled: $\frac{82827}{8} = 10353.375$

9) $v(t) = 4t^3 - 33t^2;\ 8 \leq t \leq 11$

Displacement: 1536

Distance traveled: $\frac{198699}{128} \approx 1552.336$

10) $v(t) = 2t - 10;\ 2 \leq t \leq 6$

Displacement: –8

Distance traveled: 10

A particle moves along a coordinate line. Its acceleration function is $a(t)$ for $t \geq 0$. For each problem, find the displacement of the particle and the distance traveled by the particle over the given interval.

11) $a(t) = 2;\ v(0) = 0;\ 0 \leq t \leq 9$

Displacement: 81
Distance traveled: 81

12) $a(t) = -6t + 28;\ v(0) = 0;\ 8 \leq t \leq 10$

Displacement: 16
Distance traveled: $\frac{784}{27} \approx 29.037$

13) $a(t) = -6t + 56;\ v(0) = -196;\ 3 \leq t \leq 10$

Displacement: 203
Distance traveled: $\frac{7831}{27} \approx 290.037$

14) $a(t) = 2;\ v(0) = -6;\ 0 \leq t \leq 9$

Displacement: 27
Distance traveled: 45

15) $a(t) = 6t - 44;\ v(0) = 121;\ 0 \leq t \leq 5$

Displacement: 180
Distance traveled: $\frac{5788}{27} \approx 214.37$

16) $a(t) = 12t^2 - 90t;\ v(0) = 0;\ 7 \leq t \leq 13$

Displacement: −1650
Distance traveled: $\frac{453211}{128} \approx 3540.711$

17) $a(t) = 2;\ v(0) = -7;\ 1 \leq t \leq 5$

Displacement: −4
Distance traveled: $\frac{17}{2} = 8.5$

18) $a(t) = 12t^2 - 84t;\ v(0) = 0;\ 6 \leq t \leq 16$

Displacement: 9920
Distance traveled: $\frac{116539}{8} = 14567.375$

19) $a(t) = -6t + 16;\ v(0) = 0;\ 5 \leq t \leq 8$

Displacement: −75
Distance traveled: $\frac{2071}{27} \approx 76.704$

20) $a(t) = 12t^2 - 66t;\ v(0) = 0;\ 2 \leq t \leq 11$

Displacement: 72
Distance traveled: $\frac{386091}{128} \approx 3016.336$