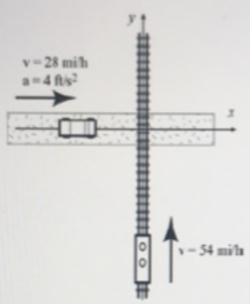
Question: A train and a car are approaching a road crossing. At time t-0 ...

A and B
Matlab

a. A train and a car are approaching a road crossing. At time t=0 the train is 400 ft south of the crossing traveling north at a constant speed of 54 mi/h. At the same time the car is 200 ft west of the crossing traveling east at a speed of 28 mi/h and accelerating at 4 ft/s^2. Determine the positions of the train and the car, the distance between them, and the speed of the train relative to the car every second for the next 10 seconds. To show the results, create an 11x6 matrix in which each row has the time in the first column and the train position, car position, distance between the train and the car, car speed, and the speed of the train relative to the car, in the next five columns, respectively.



Hints:
The position of an object that moves along a straight line at a constant acceleration is given by $s=s_0+v_0t+\frac{1}{2}at^2$ where s_0 and v_0 are the position and velocity at t=0, and a is the acceleration. Applying this equation to the train and the car gives:

$$y=-400+v_{0train}t \qquad \text{(train)}$$
$$x=-200+v_{0car}t+\frac{1}{2}a_{car}t^2 \qquad \text{(car)}$$

The distance between the car and the train is $d=\sqrt{x^2+y^2}$.
The velocity of the train is constant and in vector notation is $v_{train}=v_{0train}\,j$
The car is accelerating and its velocity at time t is given by $v_{car}=(v_{0car}+a_{car}t)i$. The velocity of the train relative to the car, $v_{t/c}$, is given by $v_{t/c}=v_{train}-v_{car}=-(v_{0car}+a_{car}t)i+v_{0train}j$. The magnitude (speed) of this velocity is the length of the vector.

b. Plot the function $y=3x^3-26x+10$, and its first and second derivatives, for $-2\le x\le 4$, all in the same plot.

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Expert Answer

nnishant answered this
59 answers

Was this answer helpful? 0 0

--PART A---

For the first part of the question, create three files - pos_train.m, pos_car.m and main.m. The code for each of these file is given below:

---code for pos_train.m--

```
function pos = pos_train(speed, time)
%   speed - The given speed of the train in miles/hour
%   time   - The time at which the speed is to be calculated
pos = (-400 + speed*5280/3600 * time);
end
```

--code for pos_car.m---

```
function pos = pos_car(speed, acceleration, time)
%   speed - The given speed of the car in miles/hour
%   acceleration - The acceleration of the car in feet/second^2
%   time   - The time at which the speed is to be calculated
pos = -200 + speed*5280/3600 * time + (1/2) * acceleration * time * time;
end
```

--code for main.m---

```
u_car = 28;     % miles per hour
u_train = 54;   % miles per hour
acc_car = 4;    % feet per second squared
res = zeros(11,6); % result matrix of dimesions 11x6
% time, train_pos, car_pos, dist_train_car, car_speed, train_car_rel_speed
for i=1:11
res(i, 1) = i - 1;
res(i, 2) = pos_train(u_train, res(i, 1));
res(i, 3) = pos_car(u_car, acc_car, res(i, 1));
res(i, 4) = sqrt(res(i, 2)**2 + res(i, 3)**2);
res(i, 5) = u_car + acc_car * res(i, 1);
res(i, 6) = abs((u_train*i - (res(i, 5))));
end
display(res);
```

Now place all the above files in one folder. Open matlab and navigate to the folder with these files and run main.m . This is the main file which will call the other two files and produce the output. After running you should see the output on the command window.

---PART B---

For this part create four files named - fn.m, dfn.m, ddfn.m, main.m. The code for these files are given below:

--code for fn.m---

```
function f = fn(x)
% This represents the actual function
f = 3*(x.**3) - 26*x + 10;
end
```

--code for dfn.m--

```
function f = dfn(x)
% This represents the first derivative of the given function
f = 9*(x.**2) - 26;
end
```

---code for ddfn.m---

```
function f = ddfn(x)
% This represents the second derivative of the function
f = 18*x;
end
```

--code for main.m---

```
x = linspace(-2, 4, 50)
y1 = fn(x);
y2 = dfn(x);
y3 = ddfn(x);

plot(x, y1,'r');
xlabel('x');
ylabel("f(x), f'(x), f''(x)");
title("f(x) = 3x^3 - 26x + 10\nCombined plot for f(x) (red), f'(x) (green) and f''(x) (blue)")
hold on
plot(x, y2,'g');
plot(x, y3,'b');
hold off
```

Now place all the files in a separate folder. Open matlab and navigate to the folder containing these files and run main.m. You should see a popup window showing the plotted graphs.

Good Luck !

Notify me in the comments if somethings is wrong.   :)

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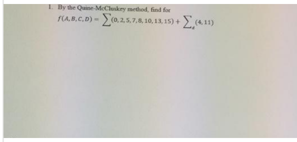
Can you also show me the truth table please?



1. By the Quine-McCluskey method, find for
$f(A,B,C,D) = \sum(0,2,5,7,8,10,13,15) + \sum_d(4,11)$

See answer

C Programming: Yahtzee consists of 6 rounds. In each round, a player rolls 5 dice with up to two re-rolls. The player chooses which dice to save and which dice to re-roll. At the end of the

See answer

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Q: 2.14) A train is travelling at a constant speed of 54 km/hr A car travelling at 72 km/hr, on reaching point A at the same time as the train reaches point B, start to accelerate uniformly at rate which enable it to just pass the crossing without being hit by the train. Compute the minimum value of the constant acceleration of the car and its velocity as it passes the crossing AC-20...

A: See answer 100% (1 rating)

Q: CAN SOMEBODY PLEASE HELP WITH THIS PROBLEM ..i WILL RATE RIGHT AWAY THANK YOU As you are driving down the highway you notice that you are approaching a railroad crossing. You also notice to your right that a train is approaching the same crossing. You are driving west to east, your current speed is 35 miles per hour, you are accelerating at 5 feet per second per second, and you are...

A: See answer 100% (1 rating)

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