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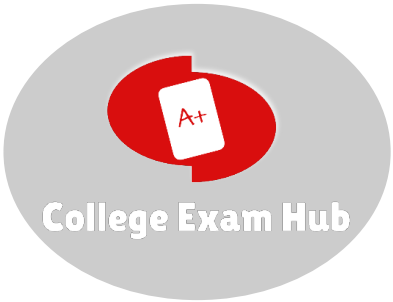

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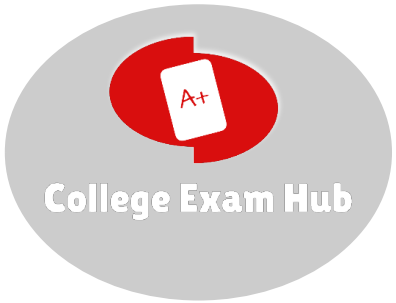

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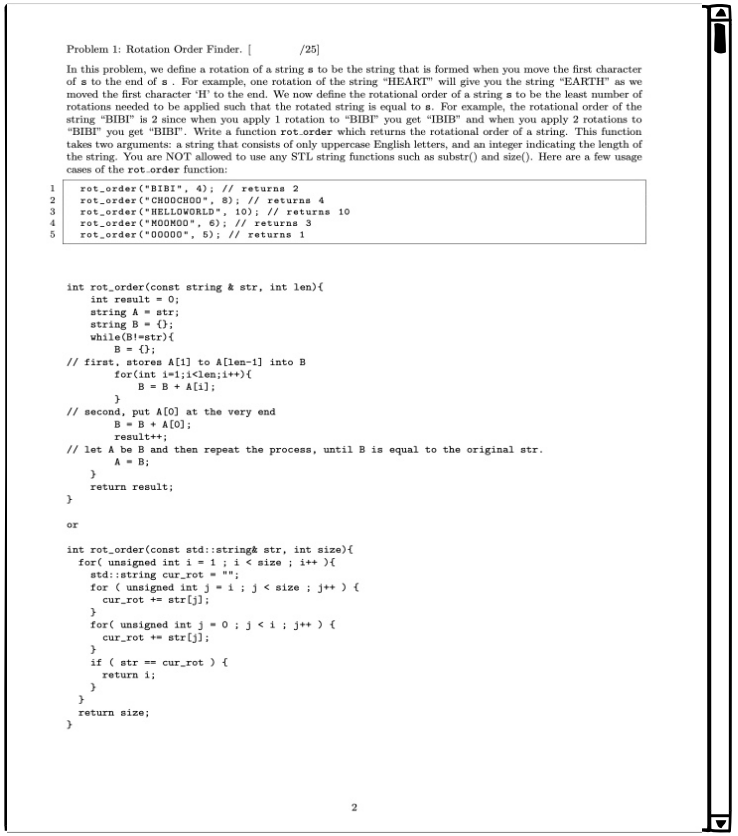

Problem 1: Rotation Order Finder. [/25]

In this problem, we define a rotation of a string s to be the string that is formed when you move the first character of s to the end of s . For example, one rotation of the string "HEART" will give you the string "EARTH" as we moved the first character 'H' to the end. We now define the rotational order of a string s to be the least number of rotations needed to be applied such that the rotated string is equal to s. For example, the rotational order of the string "BIBI" is 2 since when you apply 1 rotation to "BIBI" you get "IBIB" and when you apply 2 rotations to "BIBI" you get "BIBI". Write a function rot_order which returns the rotational order of a string. This function takes two arguments: a string that consists of only uppercase English letters, and an integer indicating the length of the string. You are NOT allowed to use any STL string functions such as substr() and size(). Here are a few usage cases of the rot_order function:

```
1  rot_order("BIBI", 4); // returns 2
2  rot_order("CHOOCHOO", 8); // returns 4
3  rot_order("HELLOWORLD", 10); // returns 10
4  rot_order("MOOMOO", 6); // returns 3
5  rot_order("OOOOO", 5); // returns 1
```

```
int rot_order(const string & str, int len){
    int result = 0;
    string A = str;
    string B = {};
    while(B!=str){
        B = {};
// first, stores A[1] to A[len-1] into B
        for(int i=1;i<len;i++){
            B = B + A[i];
        }
// second, put A[0] at the very end
        B = B + A[0];
        result++;
// let A be B and then repeat the process, until B is equal to the original str.
        A = B;
    }
    return result;
}

or

int rot_order(const std::string& str, int size){
  for( unsigned int i = 1 ; i < size ; i++ ){
    std::string cur_rot = "";
    for ( unsigned int j = i ; j < size ; j++ ) {
      cur_rot += str[j];
    }
    for( unsigned int j = 0 ; j < i ; j++ ) {
      cur_rot += str[j];
    }
    if ( str == cur_rot ) {
      return i;
    }
  }
  return size;
}
```

2

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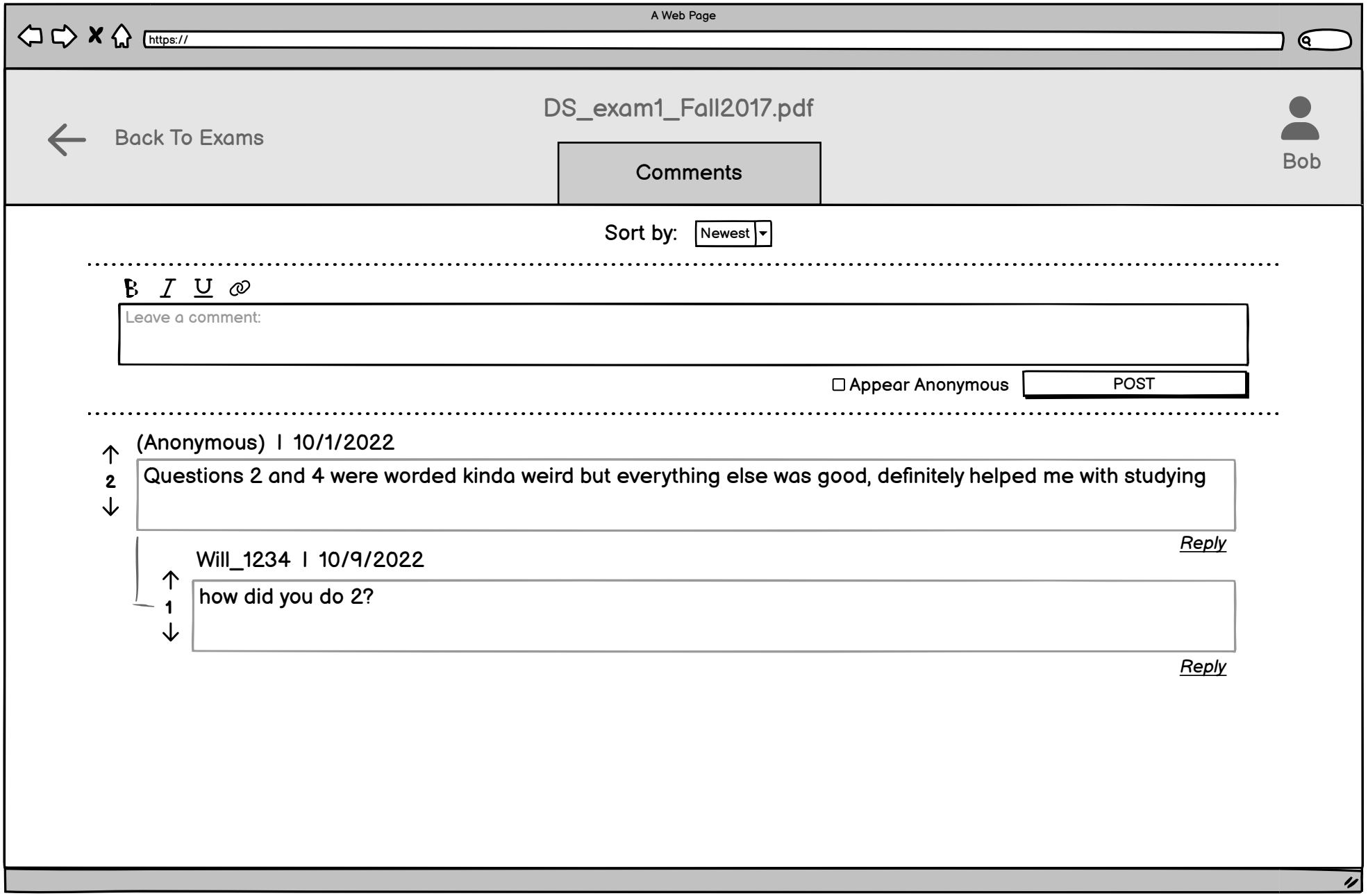
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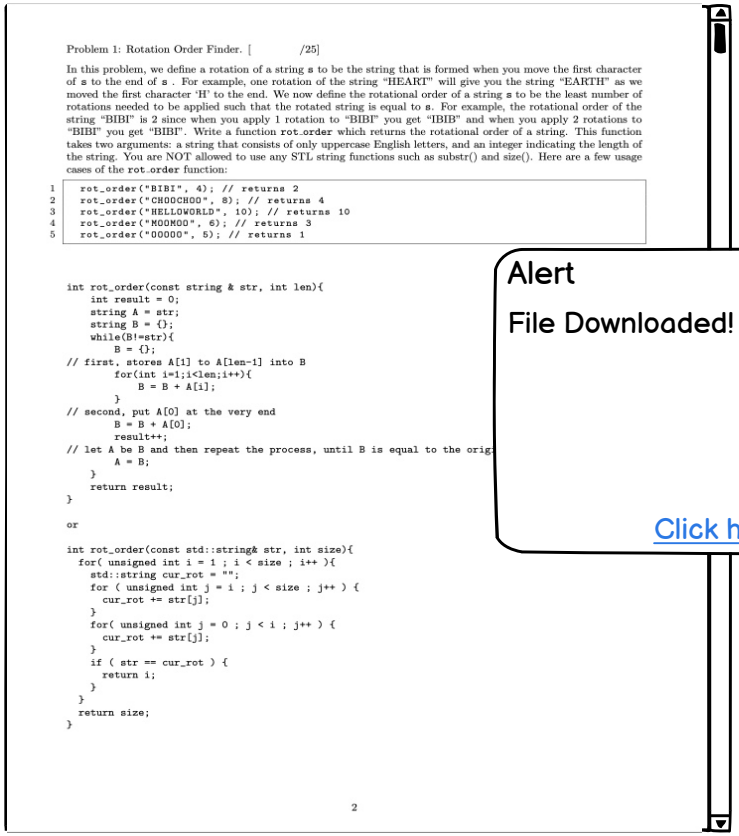

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      cur_rot += str[j];
    }
    if ( str == cur_rot ) {
      return i;
    }
  }
  return size;
}
```

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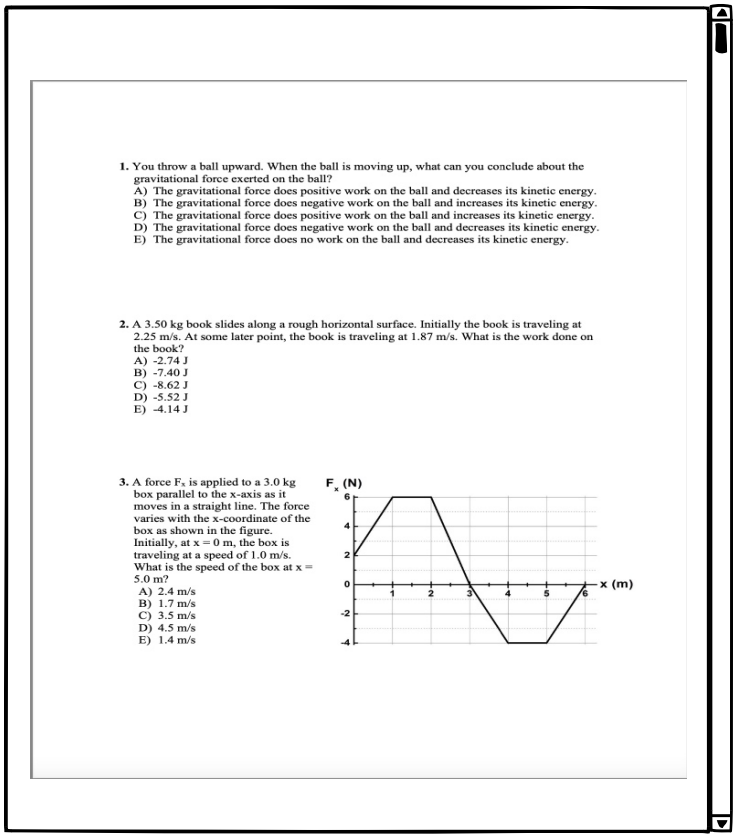

1. You throw a ball upward. When the ball is moving up, what can you conclude about the gravitational force exerted on the ball?
   A) The gravitational force does positive work on the ball and decreases its kinetic energy.
   B) The gravitational force does negative work on the ball and increases its kinetic energy.
   C) The gravitational force does positive work on the ball and increases its kinetic energy.
   D) The gravitational force does negative work on the ball and decreases its kinetic energy.
   E) The gravitational force does no work on the ball and decreases its kinetic energy.

2. A 3.50 kg book slides along a rough horizontal surface. Initially the book is traveling at 2.25 m/s. At some later point, the book is traveling at 1.87 m/s. What is the work done on the book?
   A) -2.74 J
   B) -7.40 J
   C) -8.62 J
   D) -5.52 J
   E) -4.14 J

3. A force F_x is applied to a 3.0 kg box parallel to the x-axis as it moves in a straight line. The force varies with the x-coordinate of the box as shown in the figure. Initially, at x = 0 m, the box is traveling at a speed of 1.0 m/s. What is the speed of the box at x = 5.0 m?
   A) 2.4 m/s
   B) 1.7 m/s
   C) 3.5 m/s
   D) 4.5 m/s
   E) 1.4 m/s

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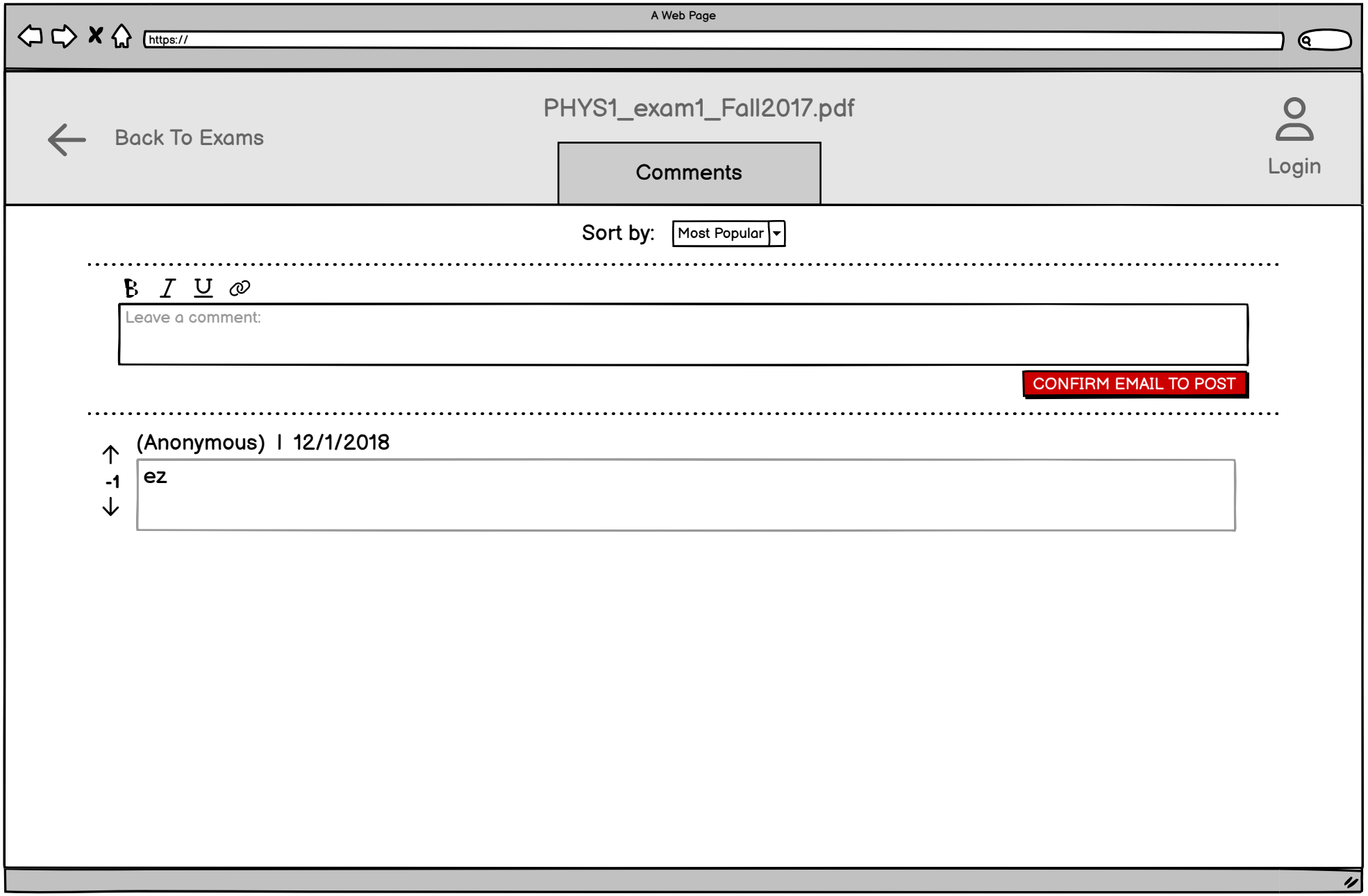
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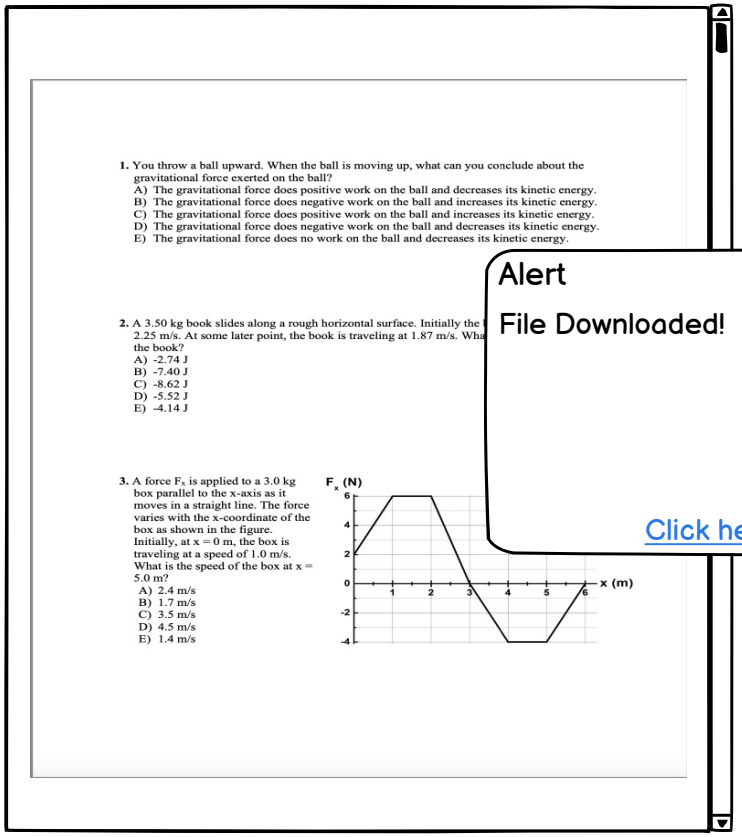

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