Math 211 Final
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Name: _____

1. Suppose that `cptr` has been declared to be a pointer to a `char` and also suppose that a `long` takes the same space as `4` `char`'s. Explain why the following two statements have the same effect on the value stored in `cptr`:

```
cptr+=4;
```
and
```
((long*)cptr)++;
```

The effect of adding an integer to a pointer depends on what kind of a pointer it is: the precise effect of adding an integer `m` to a pointer to a data structure of size `S` is to add `m*S` to the actual address. Since `cptr` points to a `char` the effect of `cptr+=4` is to add `4` times the size of a `char` to the current address. (A `char` usually has size one, but this is not relevant to this discussion.) In the statement `((long*)cptr)++;` we have parenthesized so that first `cptr` is type cast to a `long` pointer (which doesn't change the address to which it points) and then one is added to it, so the size of a `long` is added to it. But you were told that the size of a `long` is four times the size of a `char`.

2. If we solve the second order differential equation

$$y'' = y' - y$$

with initial condition $y(0) = 1$ and $y'(0) = 2$ via power series method $y = \sum_{n=0}^{\infty} a_n\, x^n$, we get $a_0 = 1$, $a_1 = 2$ and

$$a_n = \frac{a_{n-1}}{n} - \frac{a_{n-2}}{n(n-1)}$$

for $n > 1$. Write a function with declaration

```
double coef(short n);
```

which recursively computes a_n.
As an example, the statement `d=coef(3);` should put $-0.166\cdots$ into `d`.

Be sure to consider what happens if some idiot writes `d=coef(-4);` and handle it sensibly. (An infinite loop is NOT sensible, but as there is no real value to be returned, any return is OK.)

```
double coef(short n){/* Your code here */
```

```
double coef(short n){/* Your code here */
```

```
if(n<0) {return (-1); }
else if (n==0) {return(1); }
else if (n==1) {return(2); }
else {return( coef(n-1)/n-coef(n-2)/(n(n-1))); }
   }
```

3. Suppose we have some function whose code begins with the following declarations and initializations.

```
int ix=1, iy=2;
int *ip=&ix;
```

1. If the next line reads
   `*ip=iy;`
   what values do both `ix` and `iy` have?

   `ix = 2`
   `iy = 2`

2. If *instead* of 1. the next line reads
   `iy=*ip;`
   what values do both `ix` and `iy` have?

   `ix = 1`
   `iy = 1`

3. If *instead* of 1. or 2. the next line reads
   `iy=(*ip)++;`
   what values do both `ix` and `iy` have?

   `ix = 2`
   `iy = 1`

4. Finally, a multiple choice question! Given the declarations `short i, j, k;` determine which value below is the value of `i` after the following statements execute: `i=k=1; j=2; j*=++k; i=k+j;`

(a) 6 (b) 5 (c) 4 (d) 2 (e) 1

Which value is the value of `j`?

(a) 6 (b) 5 (c) 4 (d) 2 (e) 1

Which value is the value of `k`?

(a) 6 (b) 5 (c) 4 (d) 2 (e) 1

After the first statement is carried out,

i=1 and k=1 and j is unknown.
After the second statement is carried out,
i=1; j=2; k=1;
After the third statement is carried out, i=1; j=4; k=2;
After the fourth statement is carried out, i=6;j=4; k=2;
Hence the answers are
question 1 => (a)
question 2 => (c)
question 3 => (d)