Practice Exam Problems (Sections 4-7)

This is the (non randomized) review to help check that the you have good footing on sections 4-7 before moving on. This is not intended to represent the length or plausible difficulty of an exam on this topic; it should help direct you to the sections where you are weakest/strongest in your studying.

```javascript
                                        JavaScript
1   // Check to see if input is positive.
2     function isPositive(number) {
3       return number > 0;
4     };
5
6
7
8
9   // Check to see if two inputs are the same parity in terms of even/odd.
10    function sameParity(a,b) {
11      return (a-b)%2 == 0;
12    };
13
14
15
16
17  // Check to see if two strings match in a case-insensitive way.
18    caseInsensitive = function(a,b) {
19      return a.toLowerCase() == b.toLowerCase();
20    };
21
22
23
24
25  // sameDerivative checks to see if the derivative with respect to x and C are equal.
26    sameDerivative = function(a,b) {
27      return (a.derivative('x').equals( b.derivative('x') ) && a.derivative('C').equals( b.derivative('C') )) ;
28    };
29
30
31
32
33  // No idea what this is doing... demonstrating the ''promise'' feature maybe?
34  slowOdd = function(a) {
35      return new Promise( function(resolve, reject) {
36          if (a == 0)
37              reject('I do not like zero.');
38          else
39              setTimeout(function(){
40              resolve(a % 2 == 1);
41              }, 1000);
42          });
43      };
44
45  // A validator to check and verify something has a factored form...
46  function factorCheck(f,g) {
47      // This validator is designed to check that a student is submitting a factored polynomial. It works by:
48      //   Checking that there are the correct number of non-numeric and non-inverse factors as expected,
```

Learning outcomes:

```
49    //  Checking that the submitted answer and the expected answer are the same via real Xronos evaluation,
50    //  Checking that the outer most (last to be computed when following order of operations) operation is mu
51
52    var operCheck = f.tree[0];// Check to see if the root operation is multiplication at end.
53    var studentFactors = f.tree.length;// Temporary number of student-provided factors (+1 because of root op
54
55    // Now we adjust the length to remove any numeric factors, or division factors, etc to avoid ''padding''
56    for (var i = 0; i < f.tree.length; i++) {
57        if ((typeof f.tree[i] === 'number')||(f.tree[i][0] == '-')||(f.tree[i][0] == '/')) {
58            studentFactors = studentFactors - 1;
59        }
60    }
61
62    // Now we do the same with the provided answer, in case sage or something provides a weird format.
63    var answerFactors = g.tree.length;
64
65    // Adjust length in the same way, so that it will match the students if it should.
66    for (var i = 0; i < g.tree.length; i++) {
67        if (typeof g.tree[i] === 'number') {
68            answerFactors = answerFactors - 1;
69        }
70    }
71
72    // Note: An especially dedicated student could pad with weird factors that are happen to cancel down to 1
73    // For example, a student could enter sin^2(x)+cos^2(x) as a multiplicative factor to pad the number of f
74    // This would be somewhat difficult to think of, even on purpose.
75    // Until I can reliably evaluate the factors themselves as functions though, there isn't a lot to be done
76
77    return ((f.equals(g))&&(studentFactors==answerFactors)&&(operCheck=='*'))
78 };
79
80
81
82
83
84
85
86
```

Problem   1 *In a residential neighborhood most families have multiple cars; at least one for each parent and maybe one for the kids over 16. You have learned to recognize every car in your neighborhood and which house it belongs to. What is the domain of this association (recognizing the car and then recalling which house it belongs to)?*

Multiple Choice:

(a) *The houses in the neighborhood.*

(b) *Your individual neighbors.*

(c) *The cars in the neighborhood.* ✓

Problem   1.1 *What is the codomain?*

Multiple Choice:

(a) *The houses in the neighborhood.* ✓

(b) *Your individual neighbors.*

(c) *The cars in the neighborhood.*

Problem **1.1.1** *Is this association a function?*

Multiple Choice:

(a) *No, each house has multiple cars.*

(b) *No, each car belongs to multiple people.*

(c) *Yes, each car belongs to one house.* ✓

(d) *Yes, each house has one car.*

Problem **2** *You decide to plant pines trees to provide a privacy screen around a piece of your property. Use the following information to answer the questions.*

- *You choose white pine as it is a fast-growing variety.*

- *At the time of planting, the trees are all 2 feet tall.*

- *This species of tree grows an average of 2.7 feet per year.*

- *The land you wish to screen is 14 feet by 20 feet.*

- *You think pine trees are quite pretty.*

Problem **2.1** *After looking up information you determine it is easiest to first figure out how high the trees will be (on average) each year, and then use that to determine how long you must wait. When writing a mathematical expression for this, what should the independent variable be?*

Multiple Choice:

(a) *The height of the trees.*

(b) *The time in years.* ✓

(c) *The height of the trees at planting.*

Problem **2.1.1** *Does this expression represent a function?*

Multiple Choice:

(a) *Yes, there are multiple trees to track per year.*

(b) *Yes, for each year there is only one height that we are calculating (the average).* ✓

(c) *No, for each year this is only one height that we are calculating (the average).*

(d) *No, multiple trees means there will be many different heights at the end of each year.*

(e) *No, there are multiple years where trees could be the same height.*

Problem **2.1.1.1** *Write an equation describing this relationship using t for the time in years and h for the height of the trees in feet.* $\boxed{h} = \boxed{2.7t + 2}$

Problem **2.1.1.1.1** *Identify the domain, codomain, and whether this equation is a function.*
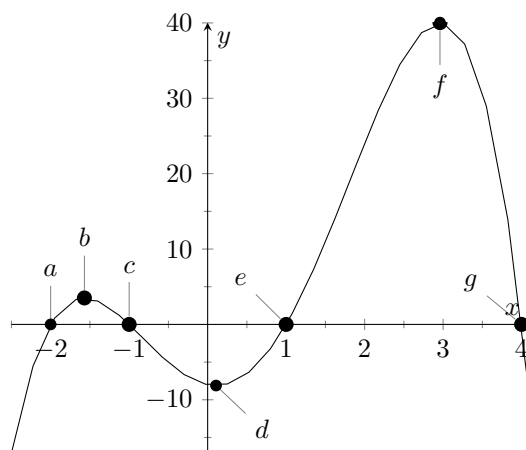
Multiple Choice:

(a) **Domain:** *height in feet;*
    Codomain: *time in years;*
    Is it a function? *yes*

(b) **Domain:** *time in years;*
    Codomain: *height in feet;*
    Is it a function? *no*

(c) **Domain:** *height in feet;*
    Codomain: *time in years;*
    Is it a function? *no*

(d) **Domain:** *time in years;*
    Codomain: *height in feet;*
    Is it a function? *yes* ✓

Problem   3 *Does the following graph depict a function?*
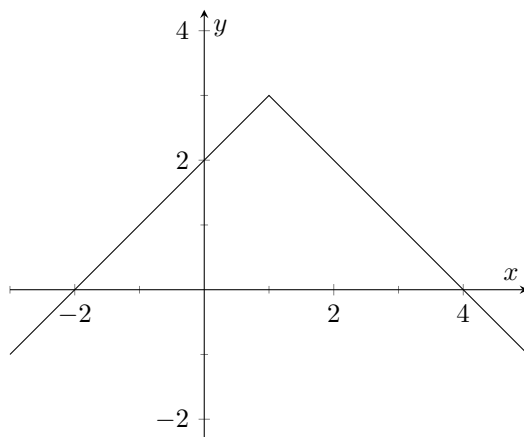
Multiple Choice:

(a) *Function* ✓

(b) *Not a function*

Use the following graph for Problems 4-7.

Problem 4 *Is the function that is shown continuous?*

Multiple Choice:

(a) *Continuous* ✓

(b) *Not continuous*

Problem 5 *Which points mark local extrema? (Select all that apply).*

Select All Correct Answers:

(a) *a*

(b) *b* ✓

(c) *c*

(d) *d* ✓

(e) *e*

(f) *f* ✓

(g) *g*

Problem 5.1 *Identify whether these points are maxima or minima.*

   Point b is a

Multiple Choice:

(a) *Maximum* ✓

(b) *Minimum*

   Point d is a

Multiple Choice:

(a) *Maximum*

(b) *Minimum* ✓

   Point f is a

Multiple Choice:

(a) *Maximum* ✓

(b) *Minimum*

Problem 6 *Which points are absolute extrema? Select all that apply.*

Select All Correct Answers:

(a) *a*

(b) *b*

(c) *c*

(d) *d*

(e) *e*

(f) *f* ✓

(g) *g*

Problem 6.1 *Is this point a maximum or minimum?*

Multiple Choice:

(a) *Maximum* ✓

(b) *Minimum*

Problem 7 *Identify the zeros of the function. (Select all that apply.)*

Select All Correct Answers:

(a) *a* ✓

(b) *b*

(c) *c* ✓

(d) *d*

(e) *e* ✓

(f) *f*

(g) *g* ✓

Problem **8** *Does the following graph depict a function?*
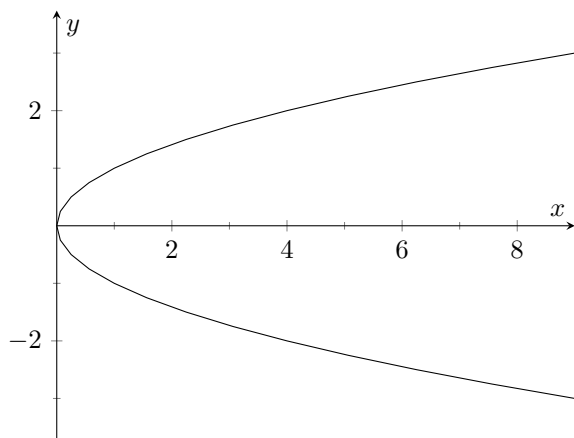
Multiple Choice:

(a) *Function*

(b) *Not a function* ✓

Problem **9** *Use the plot to answer the questions.*
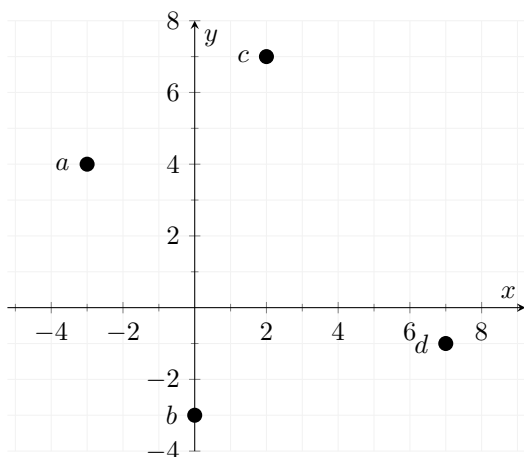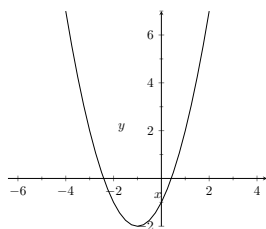

What are the coordinates of point a? (-3, 4)

What are the coordinates of point b? (0, -3)

What are the coordinates of point c? (2, 7)
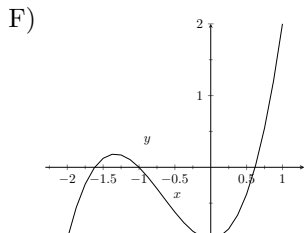
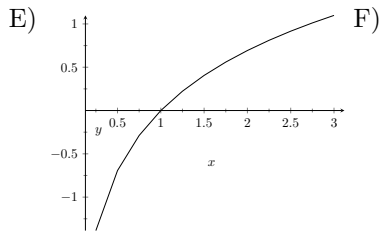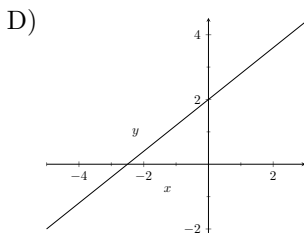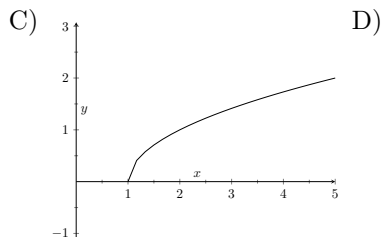*What are the coordinates of point d?* (7, -1)

Match the graph manipulations to the appropriate **parent functions** (**NOTE:** not the actual function of the graph, but the parent function of the graph).

A)

B)

C)

D)

E)

F)
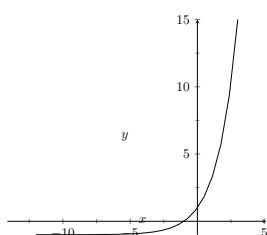
Problem 10 *Which graph would most properly be said to have a parent function of $f(x) = x^2$*

Plot: $\boxed{A}$

Problem 11 *Which graph would most properly be said to have a parent function of $f(x) = \sqrt{x}$*

Plot: $\boxed{C}$

Problem 12 *Which graph would most properly be said to have a parent function of $f(x) = x$*

Plot: $\boxed{D}$

Problem 13 *Which graph would most properly be said to have a parent function of $f(x) = e^x$*

Plot: $\boxed{B}$

Problem 14 *Which graph would most properly be said to have a parent function of $f(x) = x^3$*

Plot: $\boxed{F}$

Problem 15 *Which graph would most properly be said to have a parent function of $f(x) = \ln(x)$*

Plot: $\boxed{E}$

Problem 16 *Which of the following are examples of independent variables?*

Select All Correct Answers:

(a) y = *height of a wall. You are trying to calculate the surface area of a wall for painting.* ✓

(b) C = *total cost of installing new windows. You are modeling the costs for building a house and you know each new window costs $140.*

(c) n = *the number of katanas purchased by a martial arts school. You know each katana costs $50 and you are trying to calculate the total cost to equip the school with katanas.* ✓

(d) P = *the average price of gasoline from January 1, 2018 to August 1, 2018. You are running analysis on cost to consumers for driving in the first three quarters of 2018,*
given driving distance habits and gasoline price per gallon for each week.