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Exam 1 Study Guide

Precalculus with Joe Champion, Fall 2011

Instructions for Exam 1

1. This is one of two exams while combine to count for 30% of your grade.
2. The exam has 9 exercises for 100 points and must be completed during class on 10/4/11.
3. You may only use a calculator with factory-shipped programs and a writing utensil.
4. You should simplify expressions and leave exact values unless directed otherwise.
5. To earn full credit, justify your solutions and always indicate your methods.
6. This is a guide, which means exercises are sampled from among the ideas on the exam, but are obviously different from actual exam questions.
7. The exam covers Chapters 1& 2 of the text plus in-class content and applications.

Big Ideas

The main concepts on the test include reasoning about the following. Challenging topics are underlined.

1. **Foundations** – scientific notation, ratio and proportion, solving equations, order of operations.

2. **Lines** – Finding the equation of a line through two points, computing a median-median line by hand, interpreting slope, and finding a linear regression line with a calculator.

3. **Data Analysis** – computing residuals, listing indicators of model fit using residuals, positive/negative association, weak/strong association, R^2, computing and comparing regression models with a calculator.

4. **Function Evaluation** – function notation, composition of functions, evaluating functions at expressions, interpreting and solving equations and inequalities using function notation, evaluating functions using equations, tables, and graphs.

5. **Graphs of Common Functions** – matching parent graphs to equations, 6 types of transformations, finding a plausible equation for a transformed graph

6. **Features of Graphs -** domain and range, x intercepts, y intercept, symmetry, horizontal and/or vertical asymptote(s), intervals of increasing and decreasing, local maximum and minimum point(s), interval(s) of concave up and concave down, inflection points.

Practice Exercises

1. The following gives the popularity of the name "Madelyn" among babies born in the U.S. since 2000.

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank	126	121	120	115	111	107	113	104	64	59	76

   a. Based solely on the data from 2000 and 2010, find a linear model for the rank data.
   b. Estimate the residual of your model for the year 2004. What does this residual mean in a practical sense?

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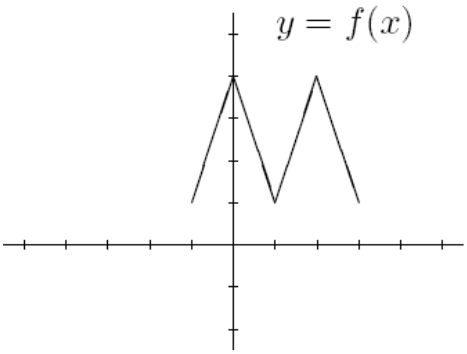
c. Compute the median-median line for the data by hand.
d. Set-up and solve an equation to find the year predicted by the median-median line for when Madelyn will become the most popular baby name in the U.S. Does this year seem plausible?
e. Find a linear regression model for the data using a calculator.
f. Plot your three models on a single calculator screen alongside the data.
g. Discuss the similarities and differences between your three models. Give at least one reason someone might use to rely on each of the models.

2. Use precise mathematical vocabulary to describe the association between average nighttime temperature and monthly plant growth. Include a hypothetical sketch of the association for a random sample of 10 locations in the U.S. over the course of a year.

3. Consider the function *f(x)* shown on the right.

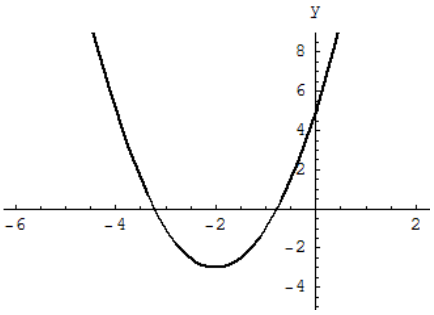


a) What are the domain and range of *f(x)*? Express your answers in interval notation.
b) Based on the graph, evaluate $f(1)$, $f(-2)$, and $f(5/2)$.
c) Solve the equation $f(x) = 2$ for *x*.
d) Which intervals of *x* values satisfy the inequality $f(x) \le 3$?
e) The curve f was drawn by connecting 4 line segments. Find equations for 2 of the line segments and specify the domain of each.
f) Modify the graph of f(x) so that it has y-axis symmetry.
g) List the intervals of increasing and decreasing for $f(x)$.
h) List the coordinate of any local extrema for $f(x)$.

4. Find the equation of $y = \frac{1}{x^2}$ reflected over the *x* axis, shifted two units to the right and 3 units down, and stretched vertically by a factor of 10. Graph the transformed function and list any asymptotes.

5. Graph $y = -.1(x + 15)^3 + 300$ by first identifying the parent graph, transformations, and a good window to show the overall shape of the graph. In addition, list the intervals of increasing/decreasing, intervals of concavity, and inflection points of the function.

6. The picture shown below is a graph of the function $y = 2x^2$ shifted horizontally and vertically. Reproduce the picture using your calculator and fill in the following information.

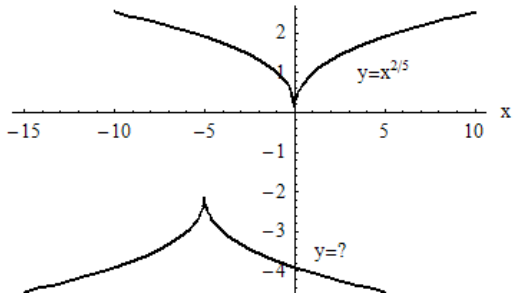


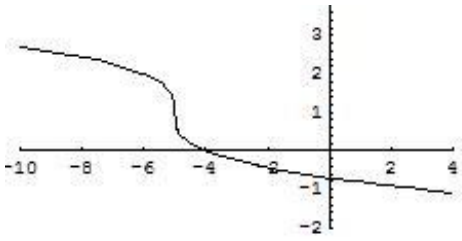
Equation:
y =

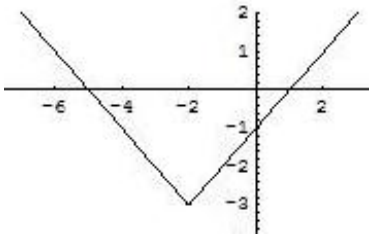
Viewing Window:

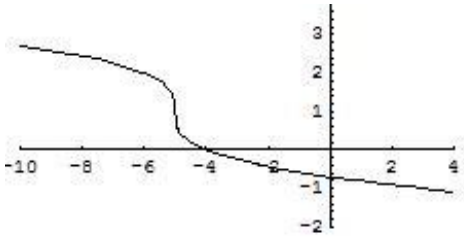
Name:_____

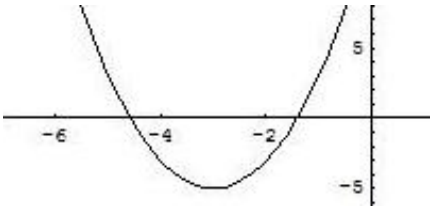
7. Find plausible equations for each of the two functions pictured below. The function $y = x^{2/5}$ is shown on the left graph as a hint.

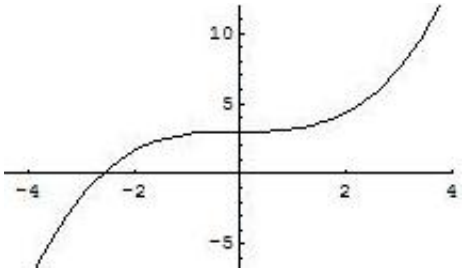


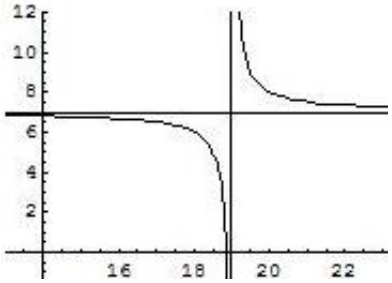


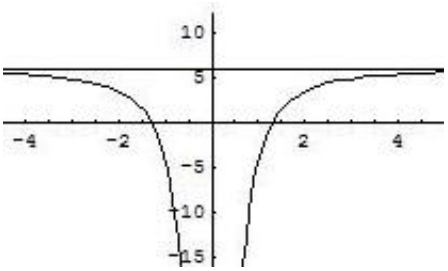












8. Find the domain and range of $H(x) = \dfrac{\sqrt{x+5}}{|2x-7|}$. In particular, explain why 3.51 must be in the domain of H.

9. Use $k(x) = \sqrt{2x+16}$ and the table for G below to evaluate $G(\text{k}(-8))$, $k(k(-6))$, $k(G(G(5)))$, and $k(2x^2 - 8) + 1$.

x	-8	5	7	9	0	4
$G(x)$	3	9	3	-2	5	1