

Math 102 Practice Test #1 Fall 2007

1. Find $\frac{f(x+h)-f(x)}{h}$ for $h \neq 0$ & simplify completely. *Hint: the solution is not 1.*

- $f(x) = \frac{1}{x+3}$.
- $g(x) = x^3 - 2$
- $p(x) = 3x^2 - 2x + 6$
- $r(x) = -3x + 100$

2. Find the domain of the following functions:

- $f(x) = \sqrt{-x - 2}$
- $r(x) = \frac{x+4}{x^3-4x}$
- $G(x) = \frac{2x}{x^2-4}$
- $d(x) = \sqrt{\frac{2}{x-1}}$
- $h(x) = \sqrt{x - 3x^2}$

3. Find $(f + g)(x)$, $(f - g)(x)$, $(f \cdot g)(x)$, $(\frac{f}{g})(x)$ and the domain of each if:

- $f(x) = \sqrt{x-1}$ and $g(x) = \sqrt{4-x}$
- $f(x) = \sqrt{x+1}$ and $g(x) = \frac{2}{x}$

4. Find the average rate of change of

- $q(x) = -2x^2 + 4$ on the interval from 0 to 2.
- $h(x) = -x^3 + 1$ on the interval from -1 to 1.

5. Consider the function $g(x) = \sqrt[3]{x}$ for the following questions:

- In interval notation, the domain of $g(x)$ is:
- The intercept(s), if any, are:
- What kind of symmetry does the graph of $g(x)$ have, if any? Why?
- Sketch the graph. Include at least three (3) points on your graph.
- Use your graph to find the range of $g(x)$.
- On what interval(s) is $g(x)$ increasing?
- Does $g(x)$ have any local extrema (i.e., any local maxima or local minima)? If so, what are they?

6. Consider the function $g(x) = -|x - 2| + 1$ for the following questions:
- In interval notation, the domain of $g(x)$ is:
 - The intercept(s), if any, are:
 - What kind of symmetry does the graph of $g(x)$ have, if any? Why?
 - Sketch the graph. Include at least three (3) points on your graph.
 - Use your graph to find the range of $g(x)$.
 - On what interval(s) is $g(x)$ increasing?
 - Does $g(x)$ have any local extrema (i.e., any local maxima or local minima)? If so, what are they?

6. Consider the following function:

$$f(x) = \begin{cases} 1 - x^2 & \text{if } x \leq 2; \\ 2x - 1 & \text{if } x > 2. \end{cases}$$

- Evaluate $f(-2)$, $f(0)$, $f(2)$.
- Sketch the graph of f .

7. Use basic shapes and transformations to sketch the graph of:

- $f(x) = 1 - \sqrt{2 - x}$.
- $q(x) = -(x + 1)^3 - 1$
- $w(x) = -\sqrt{x + 3}$
- $g(x) = |x - 2| - 5$

8. Odyssey Travel Agency's monthly profit P (in thousands of dollars) depends on the amount of money x (in thousands of dollars) spent on advertising per month according to the rule $P(x) = -x^2 + 8x + 20$.

- What would Odyssey's monthly advertising be in order to maximize its monthly profit?
- What is this maximum monthly profit?

9. If $h(x) = \frac{-2}{3}x + 4$,

- Determine the slope and y-intercept of f .
- Use the slope and the y-intercept to graph f .
- Determine the average rate of change of f on the interval $[0.3, \frac{5}{9}]$.
- Determine whether f is increasing, decreasing, or constant.

10. In 2002, major league baseball signed a labor agreement with the players. In this agreement, any team whose payroll exceeds \$128 million starting in 2005 will have to pay a luxury tax of 22.5% (for first time offenses). The linear function $T(p) = 0.225(p - 128)$ describes the luxury tax T of a team whose payroll is p (in millions of dollars).

- What is the implied domain of this function?
- What is the luxury tax for a team whose payroll is \$160 million?
- What is the payroll of a team that pays a luxury tax of \$11.7 million?

11. Sketch the graph of the following quadratic functions. Label the vertex and any intercepts, determine where the function is increasing and where it is decreasing, and find the domain and range.

- $f(x) = -3x^2 - 2x - 4$
- $h(x) = 2x^2 - x + 2$
- $g(x) = 3x^2 + 18x$

12. A company's monthly profit P (in thousands of dollars) depends on the amount of money x (in thousands of dollars) spent on advertising per month according to the rule $P(x) = 9 - 4x(x - 4)$. What is this company's maximum monthly profit?

13. The price p (in dollars) and the quantity x sold of a certain product obey the demand equation $p = -\frac{1}{3}x + 100$ for $0 \leq x \leq 300$.

- Express the revenue R as a function of x .
- What is the revenue if 100 units are sold?
- What quantity x maximizes revenue? What is the maximum revenue?
- What price should the company charge to maximize revenue?

14. David has 400 yards of fencing and wishes to enclose a rectangular area.

- Express the area A of the rectangle as a function of the width w of the rectangle.
- For what value of w is the area largest?
- What is the maximum area?

15. A farmer with 2000 meters of fencing wants to enclose a rectangular plot that borders on a straight highway. If the farmer does not fence the side along the highway, what is the largest area that can be enclosed?

16. Solve each inequality:

a. $x^2 + 3x - 10 > 0$

b. $x^2 - 1 < 0$

c. $6x^2 < 6 + 5x$

d. $-x^2 + 1 > 4x + 1$