

Name: _____

MATH 142, Test 2

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SAMPLE

Please **read** carefully, **show** all your work, and **explain** all your answers.
Credit may be reduced if work is incomplete.

Problem 1. Give each of the following functions as a command.

a) $f(x) = 2x^3 - 7$

b) $f(x) = \sqrt[3]{2x + 3}$

Problem 2. Give the “ $f(x)$ ” definitions of the functions

a) Add 4 and then take the square root

b) Cube, add 2, and then divide by 3.

Problem 3. Given $f(x) = x^3$ and $g(x) = 2x + 1$ find

a) $g(f(x)) =$

b) $f(g(x)) =$

Problem 4. Find two simpler functions f and g such that $f(g(x)) = |x^3 + 2|$.

Problem 5. Which of the following processes applied to both sides of an equation always produce an *equivalent* equation? Circle your choice(s).

- a) add 3
- b) multiply by 3
- c) cancel a common factor of $x - 3$
- d) divide by 3
- e) square
- f) multiply by $x - 3$

Problem 6. A triangle has three sides. The second is three times as long as the first, and the third is 3 centimeters shorter than the second. The perimeter is 32 centimeters.

a) Use “ x ” to represent the length of the first unknown side and build a formula for the perimeter.

b) Set up the relevant equation.

c) Solve for x .

Problem 7. Earl could rent a car A for \$30 plus 35 cents per mile. He could rent car B for \$40 plus 30 cents per mile. How many miles would he have to drive to make car B a better deal?

Problem 8. Construct the truth table for $(\text{not } A) \Rightarrow (A \text{ and } B)$.

Problem 9. Prove that the statement " $H \wedge (H \Rightarrow C) \Rightarrow C$ " is always true. This fact is known as *Modus Ponens*.

Problem 10. State the contrapositive of these:

a) If $x \geq 1$, then $|x| \geq 1$.

b) If the chair is an antique, it is over 75 years old.

Problem 11. Assuming that A is a **true (T)** statement and B is **false (F)**, indicate the truth value of each of the following compound statements.

a) $(\text{not}A) \text{ or } B$

b) $A \text{ and } (\text{not}B)$

c) $A \implies B$

d) $B \implies A$

e) $A \iff (A \text{ or } B)$

Problem 12. a) Restate, using the *theorem on cases*:

“If your earned income was more than \$4000 or your unearned income was more than \$1500, you must file a return.”

b) Restate, using the *theorem on a hypothesis in the conclusion*:

“If you attend BU, if you win the math contest, you get a trip to New York.”

Problem 13. a) Restate using a *version of the contrapositive*:

“When I am cold and wet, I am miserable.”

b) Restate using the *theorem on “or” in the conclusion*:

“When I go on vacation, I go to the ocean or to the mountains.”

Problem 14. Use *DeMorgan’s laws*. If this is false, what is true?

a) “She is tall or smart.”

b) “He is taking math and physics.”

Problem 15. Give the definition and an example of a

a) *Contradiction*

b) *Tautology*

Extra Credit.

a) True or false? $(A \text{ and } B) \Rightarrow (A \text{ or } B)$.

b) State the set-theory result corresponding to $(A \text{ and } B) \Rightarrow (A \text{ or } B)$.