

Name (print) \_\_\_\_\_ Tu/Th Discussion (circle) 12 1 2

(1) There are *seven questions* on this exam. (2) *Return* this exam copy with your exam booklet. (3) *Write* your TA's name, discussion time, and solutions to problems, in your exam booklet. (4) *Show* your work. You must give complete explanations, not just answers, for full credit. (5) Give *exact answers* whenever possible; otherwise give answers accurate to two decimal places. Sketch any calculator graph you use including the axes with a scale. (6) If you use a calculator it must be *your own*. (7) *You are expected to abide by the University's rules concerning academic honesty.*

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- (10 pts.) Let  $f(x) = x^4 + 2$ . Give the function  $g(x)$  which has the graph obtained by shifting the graph of  $f(x)$  horizontally left 7 units and then vertically down by 15 units. (Do not simplify)
  - (10 pts.) Find the inverse of the function  $f(x) = \frac{3x - 8}{2x + 5}$ .
  - (20 pts.) Given that 2 is a root of  $x^3 - 5x^2 + 2x + 8$ ,
    - find all rational roots of  $x^3 - 5x^2 + 2x + 8$  and
    - write  $x^3 - 5x^2 + 2x + 8$  as a product of linear factors.
  - (15 pts.) A box with square base and no top has a surface area of 108 square feet. Find the dimensions of the box that has the maximum volume.
  - (15 pts.) Do the following:
    - find the remainder when  $3x^6 + 6x^5 + 2x^4 + 4x^3 + 4x + 8$  is divided by  $x + 2$ , and
    - determine whether or not  $x + 2$  is a factor of  $3x^6 + 6x^5 + 2x^4 + 4x^3 + 4x + 8$ .
  - (10 pts.) Find a polynomial  $p(x)$  of degree 3 with roots  $-3$ ,  $-1$ , and  $4$  such that  $p(5) = 11$ .
  - (20 pts.) The position of the object above ground (in feet) after  $t$  seconds is given by  $h(t) = -16t^2 + v_0t + h_0$ , where  $h_0$  is the initial position of the object at  $t = 0$  and  $v_0$  is the initial velocity of the object at  $t = 0$ . An object is thrown downward from the top of a 1,200-foot building with initial velocity of 64 feet per second.
    - How long does it take for the object to reach the ground?
    - How long does it take for the object to fall to the height of 500 above the ground?