

Write your name on the cover of the test booklet and nowhere else. Failure to follow these directions will cost you 1 point. The test has 100 points (to be scaled up to 140 points) and is scheduled to take 50 minutes. Therefore, expect to spend 1 minute for every 2 points. For example, a 16-point question should take 8 minutes. I cannot allow extra time because of the class that follows our class.

Show all work and write each answer on a separate side of a sheet of paper.

The numbers refer to the sections the question came from. The sections skipped either had minor points or the material was used in later sections.

2.1) (12 points) Find the equation for a line through the points (3,4) and (6, -2). Find the equation for a line perpendicular to that line which goes through (1,0)

2.2) (12 points) Suppose $f(x) = \begin{cases} 2x - 2 & x \leq 3 \\ x & x > 3 \end{cases}$. Plot $f(x)$ from $x = -1$ to $x = 5$.

2.4) (2 points) What is $f(-2.2)$ if $f(x) = \lfloor x \rfloor$. Give one short sentence explaining how you got the answer.

2.5) (16 points) Without calculating exact points, draw $f(x) = x^2$ and $g(x) = 3(x+1)^2 + 2$ on the same graph. Briefly explain how you found $g(x)$.

2.6) (10 points) Find $(f \circ g)(x)$ (a.k.a. $f(g(x))$) if $f(x) = x^2 + 3x$ and $g(x) = x + 1$

2.7) (16 points) If $f(x) = \frac{x - 4}{x + 1}$, then find $f^{-1}(x)$. You do not need to verify it is the inverse.

3.1) (14 points) Suppose the profits of a firm are given by $f(Q) = -Q^2 + 20Q - 95$. Find the profit maximizing output (Q) and the profits. Hint: This question is really just asking what is the axis of symmetry and what is the height of the vertex?

3.3 & 3.4) (16 points) Find all zeros (roots) of EITHER the equation $f(x) = x^3 + x^2 + 4x + 4$ OR the equation $f(x) = x^3 + 6x^2 + 11x + 6$. Hints: Use Descartes' Rule of Signs. Check for rational zero(s) using synthetic division.

3.5) (2 points) In geometry, the volume of a sphere (V) is proportional to the cube of the radius (r). Write the equation for that.