APPM 1340 **Exam 3** **Fall 2017**

On the front of your bluebook, please write: a grading key, your name, student ID, your lecture number and instructor.
This exam is worth 100 points and has 6 questions.

- Submit this exam sheet with your bluebook. However, nothing on this exam sheet will be graded. Make sure all of your work is in your bluebook.
- **Show all work and simplify your answers!** Answers with no justification will receive no points unless otherwise noted. **Please begin each problem on a new page.**
- You will be taking this exam in a proctored and honor code enforced environment. This means: no notes or papers, calculators, cell phones, or other electronic devices are permitted.

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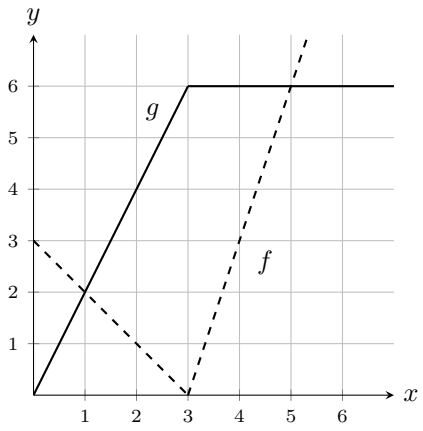
1. [24 pts] For the given function, find the indicated derivative. Simplify your final answers, writing them without fractional and/or negative exponents.

   a. $p(t) = \dfrac{1}{\sqrt{3-t}} + 2\pi^7, \;\; p'(t)$ b. $y(\theta) = \sin(\cos 6\theta), \;\; y'\left(\dfrac{\pi}{4}\right)$ c. $f(x) = x\sqrt{x^2+2}, \;\; f'(x)$

2. [12 pts] f and g are functions whose graphs are shown in the figure below. Use these to find the following.

   a. $f'(2)$ b. $g'(2)$ c. $P'(2)$, where $P(x) = \dfrac{f(x)}{g(x)}$



3. [12 pts] Consider the relation $x^2 - xy + y^2 = 3$.

   (a) Find $\mathrm{d}y/\mathrm{d}x$.

   (b) Find all points on the graph where the tangent line is horizontal.

   (c) Find all points on the graph where the tangent line is vertical.

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4. [12 pts] Two hikers start moving from the same point. One travels north at 1.5 mph and the other travels east at 2 mph. At what rate is the distance between the hikers increasing two hours later?

5. [12 pts] Find an equation of the normal line to the parabola $y = x^2 - 9x + 8$ that is parallel to the line $x - 7y - 3 = 0$. Put your answer in slope/intercept form.

6. [28 pts] Suppose the position of an object moving horizontally after t seconds is given by $s(t) = -t^3 + 6t^2 - 9t$ for $0 \leq t \leq 4$. s is measured in feet with $s > 0$ corresponding to positions to the right of the origin.

   (a) Find the velocity at time t.

   (b) Find the acceleration at time t.

   (c) When is the object not moving?

   (d) When is the object moving to the left?

   (e) When is the object moving to the right?

   (f) Where is the object at the end of the time interval?

   (g) What is the total distance that the object has traveled?