Name: _____

Please show all work and provide clear explanations. Sketch. Make conclusions.

1. (20 pts.) Let ℓ_1 be the line in the plane passing through the points $(-2, 0)$ and $(1, -4)$. Let ℓ_2 be the line through the point $(1, 1)$ that is perpendicular to ℓ_1.

   (a) Sketch both lines on a properly labelled graph.
   (b) Find equations for the lines ℓ_1 and ℓ_2.
   (c) Find the point of intersection of ℓ_1 and ℓ_2.

2. (30 pts.) For each of the following functions, find the domain and range; determine whether the function has an inverse; if so, find the inverse using the same representation technique (formula, table, graph) as for the given function.
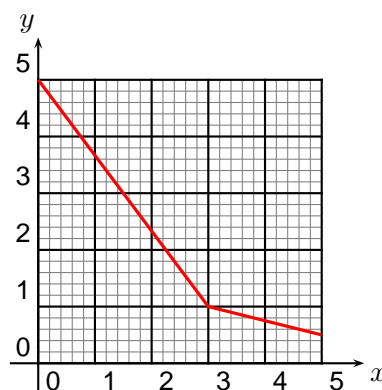
   (a) $f(x) = (x+1)^{-3}$

   (b) $f(x) = (x-1)^{\frac{1}{3}}$

   (c)
x	1	1.1	1.2
$f(x)$	-1.3	-1.1	-1.2

   (d) $f(x) = 1 + |x + 2|$

   (e) $f(x) = \begin{cases} -2x - 1 & \text{for } x < 0 \\ -x + 1 & \text{for } x > 0 \\ -0.5 & \text{for } x = 0 \end{cases}$

   (f)

3. (32 pts.) Al starts a bacillus anthracis culture in chicken soup at 35 degrees Celsius. The bacterial colony starts to grow exponentially and 36 hours later Al measures its weight to be 12.3 g. After another 24 hours the colony weighs 45.5 g.

   (a) What is the hourly percentage growth rate of anthrax in the given medium?
   (b) What is the doubling time of anthrax in the given medium?
   (c) How much bacillus anthracis did Al use to start the colony?
   (d) Al repeats the experiment with medium at 30 degrees and finds the doubling time to be 16 hours. What is the hourly percentage growth rate of this colony?

4. (20 pts.) Let $Y(t) = 1 - 0.4t + 0.015t^2$. Write $Y(t)$ in vertex form. What are the coordinates of the vertex?

5. (20 pts.) Betty is riding on a ferris wheel with diameter 30 meters. What fraction of the time is she between 12 and 20 meters above ground?

6. (20 pts.) Bonzo buys a $3,000 Certificate of Deposit bearing 4.2% APR interest compounded monthly.

   (a) How long does Bonzo need to wait for the CD to become worth $3,400?
   (b) How long would he have to wait if the interest were compounded continuously?

1	2	3	4	5	6	total (142)	(%)