

7. [7 points] Not content with rolling a whole boulder up a hill for all of eternity, Sisyphus instead opts to break up his punishment boulder into smaller pieces of rock and lift them up the hill inside a bucket.
- Suppose Sisyphus builds a platform at the top of the hill that is 15 feet above the ground. He lifts the bucket vertically from ground level to the platform. Unfortunately, the bucket has a hole where rocks can fall out.
- a. [3 points] Let  $W(y)$  be the weight of the bucket with rocks, in pounds, when it is  $y$  feet **above the ground**. Write an expression involving one or more integrals for the total work done to lift the bucket up to the platform. Your answer should involve  $W(y)$ . Do not evaluate your integral(s). Include units.

**Answer:** \_\_\_\_\_ **Units:** \_\_\_\_\_

- b. [4 points] Sisyphus lifts the bucket up at a constant rate of 2 feet per second. The weight of the bucket with rocks decreases at a rate of

$$r(t) = \frac{10}{1 + e^{-t}}$$

pounds per second, where  $t$  is measured in seconds since Sisyphus started lifting the bucket. Assume the bucket and the rocks together weigh 100 pounds initially. Find a formula for  $W(y)$  involving one or more integrals. Do not evaluate your integral(s).

**Answer:** \_\_\_\_\_