MA114 Summer 2018
Worksheet 6 – Improper Integrals – 6/15/18

1. Compute the following integrals.

(a) $\displaystyle\int_1^\infty \frac{dx}{x^{19/20}}$

(b) $\displaystyle\int_1^\infty \frac{dx}{x^{20/19}}$

(c) $\displaystyle\int_{-\infty}^4 e^{0.000001t}\,dt.$

2. Consider

$$\int_1^\infty \frac{dx}{x^p}.$$

For what values of p does the integral converge? For what values does it diverge? Justify your answer. (Think about 1a, 1b, and the examples from lecture.)

3. A manufacturer of lightbulbs wants to produce bulbs that last about 700 hours but, of course, some bulbs burn out faster than others. Let $F(t)$ be the fraction of the company's bulbs that burn out before t hours, so $F(t)$ always lies between 0 and 1.

   (a) Make a rough sketch of what you think the graph of $F(t)$ might look like.

   (b) What is the meaning of the derivative $r(t) = F'(t)$?

   (c) What is the value of $\int_0^\infty r(t)dt$? Why?