Math 141 Quiz 3 — Practice version, November 2015

Name: _____ **ID#:** _____

- You have 40 minutes.

- Complete the following two problems. In order to receive full credit, please show all of your work and justify your answers.

- You do **not** need to simplify your arithmetic unless explicitly instructed to do so in the question. However, a final answer involving a composition of a trigonometric function and an inverse-trigonometric function (in any order) will not be accepted.

- If you need extra room for your answers, use the back side of the question pages, and **clearly indicate that your answer continues there**. Do not use your own scratch paper, and do not detach pages from this booklet.

- The use of cellphones, calculators, and other electronic devices, for whatever reason, is considered cheating.

Formulae you may find useful:

$$\sin^2(\theta) = \frac{1}{2}(1 - \cos(2\theta))$$
$$\cos^2(\theta) = \frac{1}{2}(1 + \cos(2\theta))$$
$$\sin(2\theta) = 2\sin\theta\cos\theta$$

The following boxes are strictly for grading purposes. Please do not mark.

Question:	1	2	**Total**
Points:	7	14	21
Score:			

1. (7 points) Compute the following two improper integrals, or explain why they do not converge. **Simplify your answer as much as possible.**

   (a)

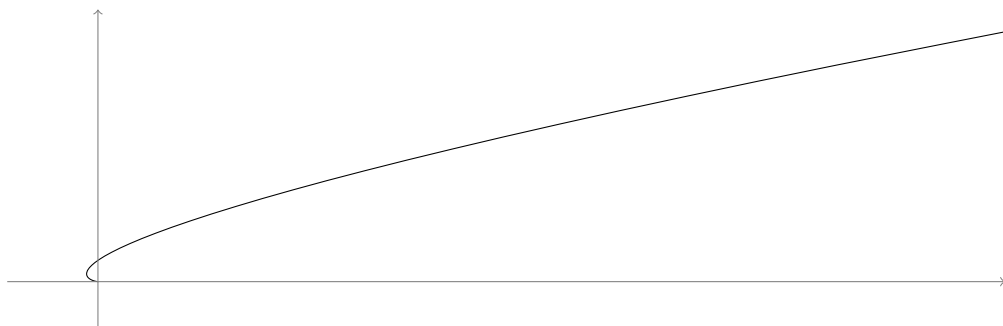 $$\int_{-\infty}^{-1} \frac{1}{(x-1)^2} - \frac{1}{(x-1)^3} \, dx.$$

   (b)

   $$\int_{0}^{1} \frac{1}{(x-1)^2} - \frac{1}{(x-1)^3} \, dx.$$

2. (14 points) Let C be the parametrised curve with equation

$$x = \frac{3}{4}t^4 - t^3, \quad y = \frac{12}{7}t^{\frac{7}{2}}, \quad t \geq 0,$$
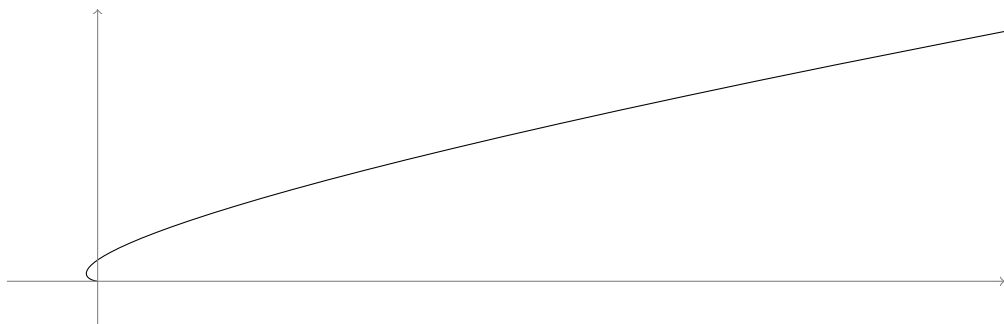
as shown in the diagram below.

(a) Find the point(s) where C has a vertical tangent. **Simplify your answer as much as possible.**

(b) For your convenience, here again is the information about the parametrised curve C:

$$x = \frac{3}{4}t^4 - t^3, \quad y = \frac{12}{7}t^{\frac{7}{2}}, \quad t \geq 0.$$

Find the length of the part of C with $2 \leq t \leq 3$. **Simplify your answer as much as possible.**