

Work through the following problems and have your tutor check your solutions and record your name before the end of your Week 13 tutorial. You are encouraged to discuss these questions and your solutions with your peers and to ask your tutor for assistance. Working through ten sets of tutorial problems is compulsory and each of the ten problem sets will contribute 0.5% towards your final grade. Note that you earn the 0.5% for your effort in solving these problems during the tutorial rather than for answering all the problems correctly.

Once you have finished these problems, you can use the remainder of your tutorial time to work on other aspects of the course. Solutions to the tutorial problems will be distributed next week.

**Make sure you have finished last week's questions.**

1. Find  $\int (-7x^2 + 6x + 3) dx$ .
2. Find  $\int (-13x^2 + 10x + 9) dx$ .
3. Find  $\int (2x^{-1} + \frac{1}{x^5}) dx$ .
4. Find  $\int (10 \sin x - 9 \cos x - 8) dx$ .
5. Find  $\int (3e^x - \frac{5}{x} + \frac{12}{x^4}) dx$ .
6. Find  $\int_{-2}^1 (15x^2 - 4x - 10) dx$ .
7. Find  $\int_{-3}^{-2} (6x^2 - 4x - 9) dx$ .
8. Find  $\int_{-2}^{-1} (3x^2 - 4x + 10) dx$ .
9. Find  $\int_{-1}^1 (-4x + 9) dx$ .
10. Find  $\int_{-1}^2 (-6x^2 + 2x) dx$ .
11. Determine the area under the curve  $y = x^2 + 2x + 4$  from  $x = 1$  to  $x = 3$ .
12. Determine the area under the curve  $y = e^{-x} + 2$  from  $x = -3$  to  $x = 1$ .

*(continued over...)*

13. Egbert breeds echidnas for export to the European Union. He spends \$175 on establishing his business. Food and other expenses cost \$10 per echidna produced. If he sets a price per echidna of  $y(x) = 50 - x$ , then he will sell  $x$  echidnas ( $0 \leq x \leq 50$ ).
- (a) What are the fixed and variable costs associated with this operation?
  - (b) Write an expression for  $c(x)$ , the total costs associated with producing  $x$  echidnas.
  - (c) Write an expression for  $r(x)$ , the total operating revenue if he sells  $x$  echidnas.
  - (d) Write an expression for  $p(x)$ , the total profit or loss he makes from selling  $x$  echidnas.
  - (e) Find the level(s) of production at which he exactly breaks even.
  - (f) What level of production results in a maximum profit? What is the maximum profit he can make?
  - (g) If the fixed costs were doubled, what impact would you expect this to have on the optimal level of echidna production?