

Business Calculus II Final Review Sheet

Remember our final is on TUESDAY MARCH 15 at 3.15pm.

1. Calculate the following indefinite integrals.

(a) $\int(2x + 1 + x^{-1})dx.$

(b) $\int \frac{3x^2+2}{x^3+2x}dx.$

(c) $\int \frac{3x^2+2}{(x^3+2x)^3}dx.$

(d) $\int(3x^2 + 2)e^{x^3+2x}dx.$

(e) $\int \frac{3x^2+2}{x^3+2x} \ln(x^3 + 2x)dx.$

2. Calculate the following definite integrals.

(a) $\int_0^1 x^3dx.$

(b) $\int_0^1 \frac{x^2}{x^3+1}dx.$

(c) $\int_0^1 xe^{x^2}dx.$

3. Calculate the areas of the following regions. Do not count areas below the x -axis as negative!

(a) The region enclosed by $y = x$ and $y = -x^4$.

(b) The region between $y = x$, $y = x^3$, $x = -1$ and $x = 1$.

(c) The region enclosed by $y = e^x$, $y = 2$ and the y -axis.

4. Sales of ice cream are continuously rising at a rate of 10 percent per month. My ice cream company currently sells 1000 quarts each month. Write down a differential equation describing the change in sales and then solve it to predict my monthly sales in 6 months time.

5. Find the equation for the tangent plane to the following surfaces at the point $(1, 2, 3)$.

(a) $z = x^2 + 3xy - \frac{2}{y} - 3.$

(b) $z = 7x - 3y + 2.$

6. Find all the critical points of the following function, and decide if they are local minima, local maxima or neither.

(a) $f(x, y) = x^2y - 2x^2 - 4y^2.$

(b) $f(x, y) = x^2 + y - e^y.$

(c) $f(x, y) = x^2 + y^2 + \frac{2}{xy}.$

(d) $f(x, y) = e^{x^2+y^2}.$

7. On my farm in Portugal, I sell cabbages and asparagus, at prices p_1 and p_2 Euros respectively. The demand function for cabbages is given by

$$q_1 = 23 - 10p_1 + p_2$$

The demand function for asparagus is given by

$$q_2 = 17 + 2p_1 - 8p_2$$

What prices should I charge in order to maximize revenue?

8. The Portuguese mail service will accept only packages of length no more than 270 cm and length plus girth no more than 325 cm. What are the dimensions of the largest package that I would be able to mail back to Eugene from my farm in Portugal?
9. Find the general solution to the following system of linear equations:

$$2x + 3y + 6z = 0$$

$$4x + 5y + 6z = 3$$

$$7x + 8y + 9z = 6$$

10. If x and y are two numbers summing to 8, what is the biggest possible value their product xy could be?
11. Solve the following differential equation subject to the initial condition that $y = 0$ when $x = 0$:

$$\frac{dy}{dx} = x(y + 1).$$