

# Math & Stats Assistance Centre

## MATH 202 Exam Review Problem List

1. Compute the following limit, or show that it does not exist:

$$\lim_{(x,y) \rightarrow (0,0)} \frac{1 - e^{x^2+y^2}}{(x^2 + y^2) \ln(2 - x^2 - y^2)}$$

2. Compute the following limit, or show that it does not exist:

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^3 - y^3}{x^3 + y^3}$$

3. (a) Find the Laplace transform of  $\sin(2t) \cos(2t)$ .

- (b) Find the inverse Laplace transform of  $\frac{1}{s+4}$ .

4. Let the pressure  $P$  and temperature  $T$  at a point  $(x, y, z)$  be

$$P(x, y, z) = \frac{x^2 + 2y^2}{1 + z^2}, T(x, y, z) = 5 + xy - z^2$$

- (a) If the position of an airplane at time  $t$  is  $(x(t), y(t), z(t)) = (2t, t^2 - 1, \cos(t))$ , find  $\frac{d}{dt} [(PT)^2]$  at time  $t = 0$  as observed from the airplane.

- (b) In which direction should a bird at the point  $(0, -1, 1)$  fly if it wants to keep both  $P$  and  $T$  constant?

5. Solve the following initial value problem, given that  $b$  is a constant such that the differential equation is exact.

$$(6xy - y^3)dx + (4y + 3x^2 + bxy^2)dy = 0, y(0) = 3$$

6. Solve the following ODE's:

(a)  $y' + 2xy = x, y(0) = 0$

(b) A particular solution to  $y'' - 2y' + y = \cos(t)e^t$

7. Find the distance between the plane  $6x + 2y - z = 1$  and the plane that passes through the points  $(1, 2, 1), (0, 4, -1), (2, -5, -7)$ .

8. Let  $\Pi_1$  be a plane containing the points  $P = (1, 0, 0)$ ,  $Q = (0, 1, 0)$ , and  $R = (0, 0, 1)$ , and let  $\Pi_2$  be another plane containing  $P$ ,  $Q$ , and  $S = -R$ . Find an equation for the line in which  $\Pi_1$  and  $\Pi_2$  intersect. What is the acute angle between  $\Pi_1$  and  $\Pi_2$ ?

9. Solve  $x'' + x = \cos(t)$ ,  $x'(0) = 0 = x(0)$  using the method of the Laplace transform.

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