

**Dawson College  
Mathematics Department  
Final Examination**

Q1 (5 marks each). Evaluate the following integrals:

a)  $\frac{13-13x}{(x+7)(x^2+3)}dx$       b)

....Q1 continues]

c)  $\frac{x^2 dx}{\sqrt{1-4x^2}}$

d)  $\int_1^{16} \frac{1}{\sqrt{x}(1+\sqrt[4]{x})} dx$

....Q1 continues]

e)  $x^2 \sin(3x) dx$

Q2 (5 marks). Find the arc length of the graph of  $f(x) = x^{3/2} - 1$  over  $0 \leq x \leq 4$ .





Q5 (5 marks each). Evaluate the following limits:

a)  $\lim_{x \rightarrow 0} \frac{2x + e^{-2x} - 1}{3x^2 - x + \sin x}$

b)  $\lim_{t \rightarrow \infty} \left(1 - \frac{4}{t}\right)^{3t}$

Q6 (5 marks each). For each of the following, determine whether the given integral converges or diverges. If it converges, find its value.

a) 
$$\int_1^{\infty} \frac{dx}{x(1+(\ln x)^2)}$$

b) 
$$\int_0^4 \frac{dx}{(4-x)^{3/2}}$$



## Possibly useful Summation Formulas

$$\sum_{i=1}^n c = cn, \quad \text{—————}$$

Q8 (5 marks) A ball bearing is dropped from a height of 8 meters onto a heavy metal plate. The ball bounces each time to a height that is  $\frac{7}{10}$  of its preceding height. Assuming that the ball continues to bounce indefinitely, find the total distance that it travels.



....Q9 continues]

$$(c) \sum_{n=1}^{\infty} \frac{2n^2+15}{3n^2-2}$$

$$(d) \sum_{n=1}^{\infty} \frac{n^4+3}{n^3(n^3+2)}$$

Q10. (4 marks) In a certain city the temperature  $T$  (in  $^{\circ}F$ ),  $t$  hours after 10 am. , was modeled by the function  $T(t) = 70 + 10\sin\frac{\pi t}{12}$ . What was the average temperature between noon and 6 pm.?

Q11 (5 marks) Find the 4<sup>th</sup> degree Taylor polynomial of  $f(x) = \sin(2x)$  centered at  $a = \pi/6$ .