Dawson College
Mathematics Department
Final Examination

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

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

….Q1 continues]

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

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

….Q1 continues]

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

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

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

a) $\lim\limits_{x \to 0} \dfrac{2x + e^{-2x} - 1}{3x^2 - x + \sin x}$

b) $\lim\limits_{t \to \infty} (1 - \dfrac{4}{t})^{3t}$

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

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

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

Possibly useful Summation Formulas

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

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 7/10 of its preceding height. Assuming that the ball continues to bounce indefinitely, find the total distance that it travels.

….Q9 continues]

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

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

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

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