

Dawson college

2. Evaluate the following integrals

(16 marks)

(a)

$$\cos^3 x \ln(\sin x) dx$$

(b)

$$\frac{e^x}{e^{3x} + e^x}$$

(c)

$$\frac{\cos x + \sin^3 x}{\sec x} dx$$

(d)

$$\frac{(x-2)^2}{5+4x-x^2} dx$$

3.

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5. Determine whether the following improper integral is convergent or divergent, if it is convergent, find its value.

(6 marks)

$$\int_0^{+\infty} \frac{1}{(1+x)\sqrt{x}} dx$$

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6. Determine whether the following improper integral is convergent or divergent, if it is convergent, find its value

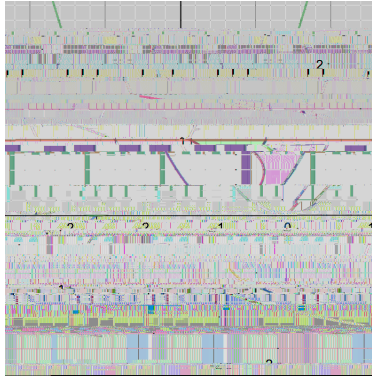
(6 marks)

$$\int_{-1}^0 \frac{e^{\frac{1}{x}}}{x^3} dx$$

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7. A certain spring system is damped so the position of the mass as a function of time is $y(t) = 2e^{-t} \cos t$. Find the average value of y over the time interval $[0, 2]$. (6 marks)

8. Let R be the shaded region bounded by $x = y - y^3$, $y = x^2$, $y = 1$ and $x = 0$. See below.

(10 marks)



(a) Set up an integral or integrals that express the area of R (DO NOT EVALUATE).

(b) Use the most convenient method(Disk method or Shell method) to set up the integral to find the volume obtained by rotating region R around $x = 2$ (DO NOT EVALUATE)

(c) Use the most convenient method(Disk method or Shell method) to set up the integral to find the volume obtained by rotating region R around x axis (DO NOT EVALUATE)

9. Find the limit of the sequence $\left\{ \frac{1}{n+1} \arctan n \right\}$

(3 marks)

10. Find the n^{th} term of the sequence

(3 marks)

$$\bar{3}, \bar{6}, 2 \bar{3}, 2 \bar{6}, 4 \bar{3}, 4 \bar{6}, \dots$$

11. Determine whether the series is convergent or divergent, if it is convergent find its sum

(3 marks)

$$\sum_{n=1}^{\infty} \left(\frac{1}{2^{n+1}} - \frac{1}{2^n} \right)$$

12.

(c)

$$\sum_{n=1}^{\infty} 2^{n-1} 3^{1-n} \cos n$$

(d)

$$\sum_{n=1}^{\infty} \frac{5^n}{(2n)!}$$

13. Find the radius of convergence and the interval of convergence of

(5 marks)

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$n=0$

14. Find the Taylor series of $f(x) = \ln(x - 1)$ about $a = 2$.

(6 marks)

