

Differential Equations - Math 207 Review of Integral Calculus

1. Explain what a definite integral is and what it represents geometrically.

2. State the Fundamental Theorem of Calculus.

3. Find each of the following derivatives.

(a) $\frac{d}{dx} \left[\int_3^x e^{t^2} dt \right]$

(c) $\frac{d}{dx} \left[\int_0^{x^3} e^{t^2} dt \right]$

(b) $\frac{d}{dx} \left[\int_x^3 e^{t^2} dt \right]$

(d) $\frac{d}{dx} \left[\int_0^4 e^{t^2} dt \right]$

4. Evaluate the following integrals without the use of a calculator.

(a) $\int_0^1 \frac{x}{4-x^2} dx$

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

(b) $\int_0^1 \frac{1}{4-x^2} dx$

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

(c) $\int_0^1 \frac{1}{4+x^2} dx$

(j) $\int_{-1}^1 \frac{x}{1+x^8} dx$

(d) $\int_0^\infty xe^{-x^2} dx$

(k) $\int \frac{\cos(3x)}{1+4\sin(3x)} dx$

(e) $\int_0^\infty xe^{-x} dx$

(l) $\int_0^\infty \frac{x}{1+x^4} dx$

(f) $\int_0^1 \frac{1}{\sqrt{1-x^2}} dx$

(m) $\int_0^{\pi/2} \cos^3 x dx$

(g) $\int_0^1 \frac{1}{\sqrt{1+x^2}} dx$

(n) $\int \arctan x dx$