

Name: Solutions

Directions: Show all work. No credit for answers without work.

1. [4 points] Evaluate the following.

(a) $\int 8 dx$

$$\boxed{8x + C}$$

(b) $\int y^5 + y^2 dy$

$$\boxed{\frac{y^6}{6} + \frac{y^3}{3} + C}$$

(c) $\int 6s^3 ds$

$$6 \cdot \frac{s^4}{4} + C = \boxed{\frac{3}{2} s^4 + C}$$

(d) $\int \frac{1}{r} dr$

$$= \boxed{\ln|r| + C}$$

(e) $\int e^{4x} dx$

$$\boxed{\frac{1}{4} e^{4x} + C}$$

(f) $\int \sqrt{x} dx = \int x^{\frac{1}{2}} dx$

$$= \boxed{\frac{2}{3} x^{\frac{3}{2}} + C}$$

(g) $\int x^e + \ln(2) dx$

$$= \boxed{\frac{x^{e+1}}{e+1} + \ln(2) \cdot x + C}$$

(h) $\int x^3(2x^2 - 5) dx$

$$= \int 2x^5 - 5x^3 dx = \boxed{\frac{1}{3} x^6 - \frac{5}{4} x^4 + C}$$

2. [2 parts, 1 point each] Types of integrals.

(a) Identify the type of the above integrals as either definite integrals or indefinite integrals.

Indefinite integrals

(b) Describe two differences between definite integrals and indefinite integrals.

(1) Definite integrals have limits of integration; indefinite integrals do not.(2) Definite integrals are numbers; indefinite integrals are families of functions.

3. [2 parts, 2 points each] Evaluate the following. Show your work.

$$(a) \int 2x(x^2 + 5)^{11} dx$$

$$\begin{aligned} w &= x^2 + 5 \\ \frac{dw}{dx} &= 2x \\ dw &= 2x dx \end{aligned}$$

$$= \int (x^2 + 5)^{11} \cdot 2x dx$$

$$= \int w^{11} \cdot dw$$

$$= \frac{w^{12}}{12} + C$$

$$= \boxed{\frac{(x^2 + 5)^{12}}{12} + C}$$

$$(b) \int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$$

$$\begin{aligned} w &= x^{\frac{1}{2}} \\ \frac{dw}{dx} &= \frac{1}{2} x^{-\frac{1}{2}} \\ dw &= \frac{1}{2} x^{-\frac{1}{2}} dx \end{aligned}$$

$$= \int e^{\sqrt{x}} \cdot x^{-\frac{1}{2}} dx$$

$$= \int e^{\sqrt{x}} \cdot 2 \cdot \underbrace{\left(\frac{1}{2} x^{-\frac{1}{2}} dx\right)}_{dw}$$

$$= \int 2e^w dw$$

$$= 2e^w + C$$

$$= \boxed{2e^{\sqrt{x}} + C}$$