Complete the following problems in preparation for your final exam.

1. Calculate the following indefinite integrals in order to find a family of anti-derivative.

(a) 
$$\int 3x^4 + \frac{4}{5x^2} dx$$
 =  $\int 3x^4 + \frac{4}{5}x^{-2} dx$   
=  $\frac{3}{5}x^5 - \frac{4}{5}x^{-1} + C$ 

(b) 
$$\int \frac{3}{x} + 7e^{x} dx$$
.  
=  $3\ln|x| + 7e^{x} + C$ 

(c) 
$$\int 36x^{3}(3x^{4} + 5)^{7} dx$$
.  
Let  $\bigcup = 3x^{4} + 5$   
 $dv = 12x^{3} dx$   $\int = 7$   $\int 0^{7} \cdot 3 dv$   
 $= 7 \quad 3 dv = 3v x^{3} dx$   $= \frac{3}{8} v^{8} + c = 7 \quad \frac{3}{8} (3x^{4} + 5)^{8} + c$   
(d)  $\int \frac{12x^{2}}{x^{3} + 1} dx$ .  
Let  $\bigcup = \chi^{3} + 1$   
 $dv = 3x^{3} dx$   $= 7 \quad \int \frac{4}{v} dv = 4 \ln |v| + c$   
 $dv = 3x^{3} dx$   $= 7 \quad \int \frac{4}{v} dv = 4 \ln |v| + c$   
 $= 7 \quad 4 \ln |x^{3} + 1| + c$ 

2. Consider the function  $f(x) = 4e^{-x^2}$  on the interval [-2, 1]. Calculate the left and right-hand Riemann Sums using three subintervals.

$$L = \frac{1 - (-2)}{3} = 1$$

$$L = \frac{1 - (-2)}{3} = \frac{1 - (-1)^{2}}{4} = \frac{(-1)^{2}}{4} = \frac{(-1)^{2}}{4}$$

$$L = \frac{1 - (-2)}{3} = 1$$

$$L = \frac{1 - (-2)}{3}$$

3. Consider an unknown function f(x) on the interval [1,7]. Suppose we do know that  $2 \le f(x) \le 4$  on [1,7]. Draw a geometric representation of this information and determine the range of value  $\int_1^7 f(x); dx$  could obtain.

$$\int_{1}^{7} f(x) dx \rightarrow represents area under f(x) on [1,7]$$
f(x)
$$\int_{1}^{7} f(x) dx \rightarrow (-1,7) ten$$

$$\int_{1}^{7} f(x) dx = (-1,7) ten$$

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4. Suppose  $\int_{-3}^{3} g(x) dx = -10$ . We also know  $\int_{1}^{3} \mathbf{g}(x) dx = 4$ , what is the value of  $\int_{-3}^{1} \mathbf{g}(x) dx$ ?

5. Calculate the following definite integrals.

(a) 
$$\int_{-1}^{1} \sqrt[3]{x} + 4x^{5} - 5 dx$$
.  

$$\int_{-1}^{1} \frac{\sqrt[4]{3}}{x} + 4x^{5} - 5 dx = \frac{3}{4} \frac{\sqrt[4]{3}}{x} + \frac{4}{6} \frac{6}{x} - 5 x = 10$$

(b) 
$$\int_0^{10} e^{4x} dx$$
. Can use "u"- sub w U= 4x or just thin K...

$$= \left. \frac{1}{4} \frac{4x}{e} \right|_{0}^{10} = \frac{1}{4} e^{-\frac{1}{4}}$$

(c) 
$$\int_{3}^{5} \frac{5x}{x^{2}} dx$$
. Let  $u = x^{3} \rightarrow du = 2x dx \Rightarrow \frac{1}{2} du = 5x dx$   
 $u = s^{3}$   
 $= \sum_{i=1}^{2} \int_{i=1}^{2} \frac{1}{2} du = \frac{5}{2} \ln |u|$   
 $u = 25$   
 $= \frac{5}{2} (\ln 25 - \ln 9)$   
 $u = 3^{3}$   
 $u = 3^{3}$   
 $\int_{i=1}^{2} \frac{1}{2} du = \frac{5}{2} \ln |u| = \frac{5}{2} \ln x^{2} \int_{3}^{5} = \frac{5}{2} (\ln 25 - \ln 9)$ 

6. Suppose you own a new company that specifically targets "millennials". You decide the best course of action is to produce avocados and "truly white" seltzers. Let x be the amount of time in months since start up, the revenue function is  $R(x) = x^2 - 3$  in hundreds of thousands of dollars, and the cost function is C(x) = 2x + 5 in hundreds of thousands of dollars. Calculate the area between the two curves on the interval [0,9] and interpret your answer in context of \* C(x) /R(x) are por month the question.

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Find if 
$$R(x) = C(x)$$
 on  $[0, q]$ .  

$$x^{2} - 3 = 2x + S = 7$$

$$x^{2} - 2x - 8 = 0$$

$$x^{2} - 4x - 8 = 0$$

$$x^{2} - 4x - 4x - 8 = 0$$

$$x^{2} - 4x - 4x - 8 = 0$$

$$x^{2} - 4x - 4x - 8 = 0$$

$$x^{2} - 4x - 4x - 4x - 4x - 4x = 0$$

$$y = (x) - R(x) - (x) - (x)$$