

**Quiz #3**

Math 140, Prof. Beydler

**Directions:** Show all work. No books or notes. A **scientific calculator** is allowed. Your desk and lap must be clear (no phones, notebooks, etc.). Write your answers in the indicated places, or box your answers. Good luck!

1. (2 points) Find the integral.

$$\int \left( 2x^{1/3} - e^{-2x} + \frac{5}{x} \right) dx$$

$$= 2 \cdot \frac{3}{4} x^{4/3} - \frac{1}{2} e^{-2x} + 5 \ln|x| + C$$

Answer:  $\frac{3}{2} x^{4/3} + \frac{1}{2} e^{-2x} + 5 \ln|x| + C$

2. (3 points) Solve the given separable initial value problem.

$$\frac{dy}{dx} = \frac{x^2}{2y}; y = 1 \text{ when } x = 0$$

$$\int 2y dy = \int x^2 dx$$

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

$$y^2 = \frac{x^3}{3} + 1$$

Find C:  
 $1^2 = \frac{0^3}{3} + C$   
 $C = 1$

Answer:  $y = \pm \sqrt{\frac{x^3}{3} + 1}$

3. (3 points) A manufacturer estimates that the marginal cost of producing  $q$  units of a certain commodity is  $C'(q) = q^2 - 10q + 60$  dollars per unit. If the cost of producing 6 units is \$1,000, what is the cost of producing 9 units?

$$\int C'(q) dq = \int (q^2 - 10q + 60) dq$$

$$C(q) = \frac{q^3}{3} - 5q^2 + 60q + K$$

$$C(q) = \frac{q^3}{3} - 5q^2 + 60q + 748$$

$$C(q) = \frac{q^3}{3} - 5(q)^2 + 60(q) + 748$$

$$= 1126$$

Answer:  $\$1126$

Find k:

$$C(6) = 1000$$

$$\frac{6^3}{3} - 5(6)^2 + 60(6) + K = 1000$$

$$K = 748$$

4. (4 points) Find the integral.

$$\int 4x(x^2 - 2)^5 dx$$

$$= \int \cancel{4x}^2 \cdot u^5 \cdot \frac{du}{\cancel{2x}}$$

$$u = x^2 - 2$$

$$du = 2x dx$$

$$\frac{du}{2x} = dx$$

$$= 2 \int u^5 du$$

$$= 2 \cdot \frac{u^6}{6} + C$$

$$= \frac{1}{3} (x^2 - 2)^6 + C$$

Answer:  $\frac{1}{3} (x^2 - 2)^6 + C$

5. (3 points) Evaluate the integral.

$$\int_0^4 (\sqrt{x} + 3) dx$$

$$= \left( \frac{2}{3} x^{3/2} + 3x \right) \Big|_0^4$$

$$= \frac{2}{3} (4)^{3/2} + 3(4) - 0$$

$$= \frac{16}{3} + 12$$

$$= \frac{52}{3}$$

Answer:  $\frac{52}{3}$