

MATH 144 FALL 2008 EXAM 3 Review

Name:

Evaluate the following integrals. Do not simplify your answer.

1. $\int 30x^4 - 6x^2 + 7dx$

2. $\int 21x^{\frac{5}{2}} - \frac{2}{x^4}dx$

3. $\int (x^2 - 5)^6 x dx$

4. $\int (x^4 + 3)(x^5 + 15x)^{-9} dx$

5. $\int (x^2 - 2)\sqrt{x^3 - 6x} dx$

6. $\int 12e^{3x} dx$

7. $\int 5x^3 e^{3x^4} dx$

8. $\int \frac{x}{7x^2 - 3} dx$

9. $\int \frac{x^3 - 8x^2 + 5}{x^3 + 5} dx$ (Hint: divide.)

10. If $\overline{MR} = 61 - 0.8x$, then what is $R(x)$?

11. The marginal revenue for a product is $\overline{MR} = 662 - 2x$, marginal cost is $\overline{MC} = 4x + 350$, and the cost of producing 5 units per week is \$1975.

(a) What is the optimal level of production?

(b) What is the revenue function?

(c) What is the total cost function?

(d) What is the profit function?

(e) Find the profit or loss if 60 units are produced and sold weekly.

12. Is $y = x^3 + 3x^2 - 2$ a solution to $y - y' = x^3 - 6x$? (Answer “Yes” or “No” and justify your answer.)

13. a) Find the general solution to $y^4 e^{7x} dx = dy$.

b) Find the general solution to $\frac{dy}{dx} = \frac{x}{y}$.

14. a) Find the particular solution to $\frac{dy}{dx} = \frac{4x}{y^3}$, when $y = 2$ and $x = 3$.

b) Find the particular solution to $y' = \frac{1}{xy}$ when $x = 1$ and $y = 3$.

15. If $x^4 + 2y^3 = 1$, find $\frac{dy}{dx}$.

16. If $5x - xy + 3y^2 = 42$, find $\frac{dy}{dx}$.

17. Write the equation of the tangent to the curve $x^2 + 3y - 2y^2 = 5$ at $(2, 1)$.

18. If $7x + y^3 - 4x^2 = 18$, find $\frac{dx}{dt}$ when $x = 2$, $y = 3$, and $\frac{dy}{dt}$.

19. A spherical balloon is being inflated by a pump that produces air at a constant rate of 430 in^3 per minute. How fast is the radius increasing when the radius is 5 inches? (You do not need to give a decimal approximation.) (**Hint:** the volume of a sphere is $V = \frac{4}{3}\pi r^3$.)

20. Two cars are approaching an intersection on roads that are perpendicular to each other. Car A is north of the intersection and traveling south at 40 mph. Car B is east of the intersection and traveling west at 55 mph. How fast is the distance between the cars changing when Car A is 15 miles from the intersection and car B is 8 miles from the intersection?