NAME _____ DATE _____ PD _____

AP CALCULUS **Chapter 6 Review**

Evaluate each indefinite integral.

1. $\int \frac{2}{x} + \frac{4}{x^5} dx$

2. $\int \frac{x^3 - x^2 + 2x + 1}{x^2} dx$

Evaluate each definite integral.

3. $\int_1^7 \frac{8}{x} + 7x^{\frac{1}{3}} + x^{-4} dx$

4. $\int_4^9 \frac{5}{x^3} + 7\sqrt{x} + \frac{1}{x} dx$

5. $\int_0^{\pi} (\sin x - \cos x)\, dx$

6. $\int_0^6 |2x - 4|\, dx$

7. $\int_0^5 |x^2 - 9|\, dx$

Graph each integrand and use the areas to evaluate each integral.

8. $\int_{-3}^5 2\, dx$

9. $\int_{-4}^4 -\sqrt{16 - x^2} dx$

Water into being pumped out of a tank. The rate at which of the water has been pumped out is given by $R(t)$, where R is measured in ounces/minutes, and t is measures in minutes.

t	0	20	60	80	90	100	120
$R(t)$	2	4	7	9	12	17	20

10. Estimate $\int_0^{120} R(t)\, dt$ using a left Riemann Sum, right Riemann Sum, and trapezoidal approximation using the six given subintervals.

11. Describe $R(70)$, $R'(70)$, $\int_0^{120} R(t)\, dt$, $\frac{1}{120}\int_0^{120} R(t)\, dt$ and in the context of the problem.

Suppose $\int_1^2 f(x)dx = 3$, $\int_5^1 f(x)dx = -13$, $\int_1^5 g(x)dx = 7$. Find each of the following:

12. $\int_3^3 g(x)dx =$

13. $\int_2^1 f(x)dx =$

14. $\int_1^5 \big(g(x) - f(x)\big)dx =$

15. $\int_2^5 f(x)dx =$

Evaluate each of the following.

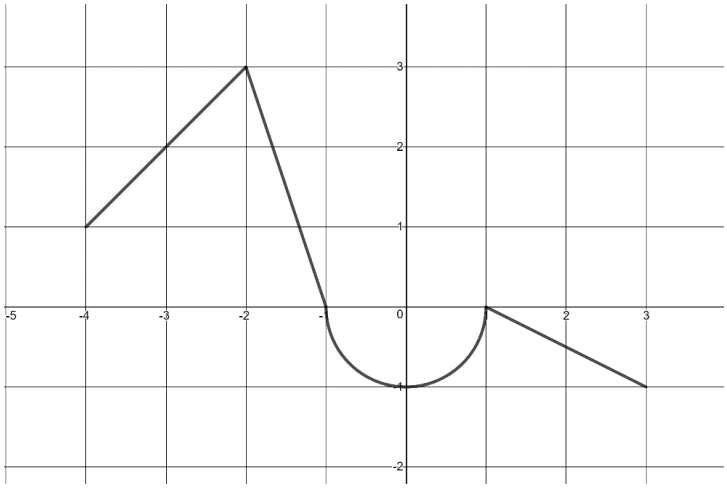
16. $\frac{d}{dx}\left[\int_x^{10} \tan(3t^2 + 9)dt\right]$

17. $\frac{d}{dx}\left[\int_{x^2}^{\cos x} \ln(t^2 + t)dt\right]$

Evaluate.

18. Write the function for $f(x)$ when $f'(x) = 2x - 3$ and $f(-2) = 3$.

19. Let f be the continuous function defined on $[-4,3]$ whose graph, consisting of three line segments and a semicircle centered at the origin, is given to the right. Let g be the function given by $g(x) = \int_1^x f(t)\,dt$.



a. Find the values of $g(2)$ and $g(-2)$.

b. Find the values of $g'(-3)$ and $g'(2)$.

c. Find the values of $g''(-3)$ and $g''(1)$ or state that it does not exist.

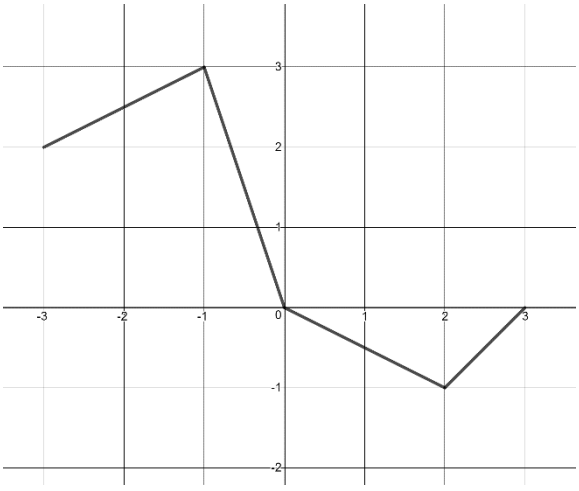
d. Find the x-coordinate of each point at which the graph of g has a horizontal tangent line. For each of these points, determine whether g has a relative minimum, relative maximum, or neither a minimum nor maximum at the point. Justify your answers.

e. For $-4 < x < 3$, find all values of x for which the graph of g has a point of inflection. Explain your reasoning.

f. Determine the absolute maximum value of g on the closed interval $-4 \le x \le 3$.

g. Determine the absolute minimum value of g on the closed interval $-4 \le x \le 3$.

20. The figure to the rights shows the graph of f', the derivative of a twice differentiable function f, on the interval $[-3,3]$.



a. Find all x-coordinates at which f has a relative maximum. Give a reason for your answer.

b. On what open intervals contains in $-3 < x < 3$ is the graph of f both concave down and decreasing? Give a reason for your answer.

c. Find the x-coordinates of all points of inflection for the graph of f. Give a reason for your answer.

d. Given that $f(2) = 4$, write an expression for $f(x)$ that involves an integral. Find $f(3)$ and $f(-3)$.

e. Determine the absolute minimum value of f on the closed interval $-3 \le x \le 3$. Justify your answer.

f. Determine the absolute maximum value of f on the closed interval $-3 \le x \le 3$. Justify your answer.

g. Graph $f(x)$.