NAME _____ DATE _____ PD _____

AP CALCULUS **Chapter 6 Review**

Evaluate each indefinite integral.

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

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

3. $\int \sqrt{x}(x^2 - 4x + 5)\,dx$

Evaluate each definite integral.

4. $\int_1^4 \frac{5}{x^3} + 7\sqrt{x} + \frac{1}{x}\,dx$

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

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

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

Water is being pumped into a tank. The rate at which of the water has been pumped 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

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

9. 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.

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

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

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

12. A particle moves along the x-axis with the velocity of $v(t) = 100\sqrt{\frac{1}{1+t^2}} - t$, where $v(t)$ is measured in meters per second. Find each of the following. Using correct units, describe each in the context of the problem.

a. $\int_0^{50} v(t)\,dt$
b. $\int_0^{50} |v(t)|\,dt$
c. $\frac{1}{50}\int_0^{50} v(t)\,dt$
d. $v(25)$
e. $v'(25)$

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:

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

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

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

Evaluate each of the following.

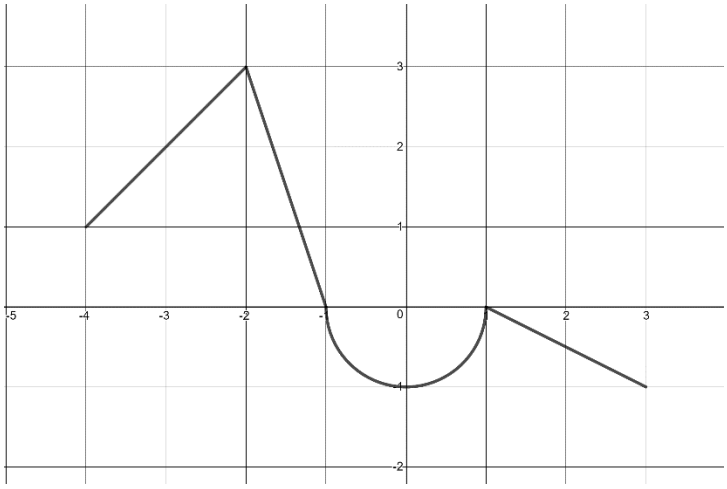
16. $\frac{d}{dx}\left[\int_x^{10} \tan(3t^2+9)dt\right]$

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.

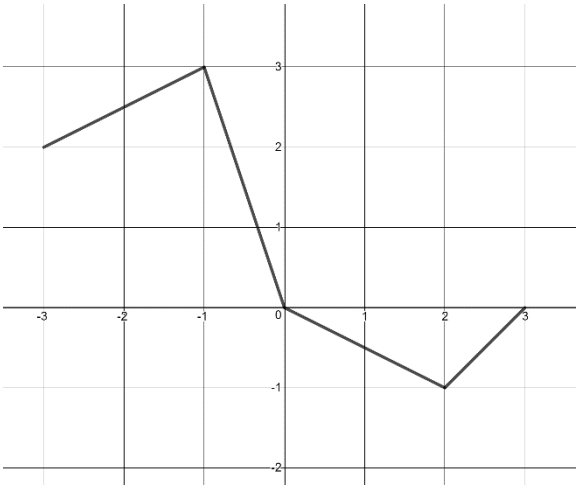
d. Find the x-coordinate of each point at which the graph of g has a horizontal tangent line. For each of these points, determine whether g has a relative minimum, relative maximum, or neither a minimum nor maximum at the point. Justify your answers.

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 $-4 \leq x \leq 3$.

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

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 $-3 \leq x \leq 3$. Justify your answer.

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

g. Graph $f(x)$.