CALCULUS
WORKSHEET 2 ON FUNDAMENTAL THEOREM OF CALCULUS

Use your calculator on problems 3, 8, and 13.

1. If $f(1)=12$, f' is continuous, and $\int_1^4 f'(x)\,dx=17$, what is the value of $f(4)$?

2. If $\int_2^5 (2f(x)+3)\,dx=17$, find $\int_2^5 f(x)\,dx$.

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3. Water is pumped out of a holding tank at a rate of $5-5e^{-0.12t}$ liters/minute, where t is in minutes since the pump is started. If the holding tank contains 1000 liters of water when the pump is started, how much water does it hold one hour later? (Use your calculator.)

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4. Given the values of the derivative $f'(x)$ in the table and that $f(0)=100$, estimate $f(x)$ for x = 2, 4, 6. Use a right Riemann sum.

x	0	2	4	6
$f'(x)$	10	18	23	25

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5. Consider the function f that is continuous on the interval $[-5,5]$ and for which $\int_0^5 f(x)\,dx=4$. Evaluate:

(a) $\int_0^5 (f(x)+2)\,dx=$

(b) $\int_{-2}^3 f(x+2)\,dx=$

(c) $\int_{-5}^5 f(x)\,dx$ (f is even) $=$

(d) $\int_{-5}^5 f(x)\,dx$ (f is odd) $=$

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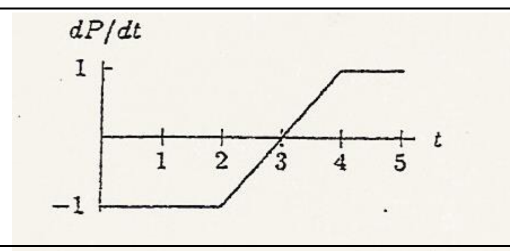
6. Use the figure on the right and the fact that $P(0)=2$ to find values of P when t = 1, 2, 3, 4, and 5.



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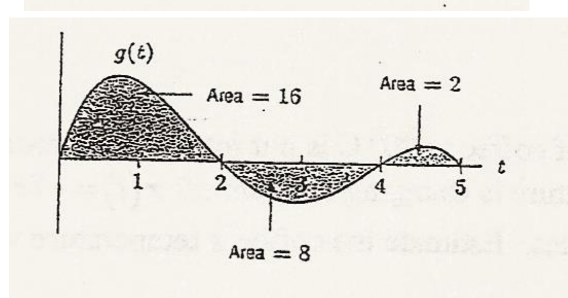
7. Given the figure on the right and the fact that $G(0)=5$. $G(t)$ is an antiderivative of $g(t)$.

(a) Find $G(2), G(4)$, and $G(5)$.

(b) Determine the intervals where the graph of G is increasing and decreasing. Justify your answer.

(c) Determine the intervals where the graph of



G is concave up and concave down. Justify your answer.

(d) Use your results to sketch the graph of $G(x)$. Label the values of at least four points.

8. Find the value of $F(1)$, where $F'(x)=e^{-x^2}$ and $F(0)=2$. (Use your calculator.)

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9. Given $f(x)=\begin{cases} 2x, & x\le 1 \\ 2, & x>1 \end{cases}$. Evaluate: $\int_{1/2}^{5} f(x)\,dx.$

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10. A bowl of soup is placed on the kitchen counter to cool. The temperature of the soup is given in
the table below.

Time t (minutes)	0	5	8	12
Temperature $T(x)$ (°F)	105	99	97	93

(a) Find $\int_0^{12} T'(x)\,dx$.

(b) Find the average rate of change of $T(x)$ over the time interval t = 5 to t = 8 minutes.

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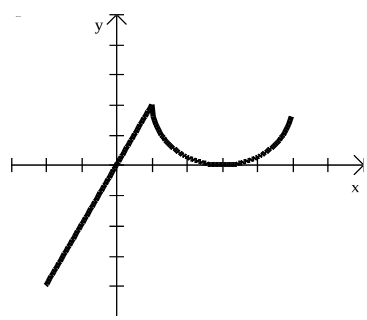
11. The graph of f' which consists of a line segment and a semicircle, is shown on the right. Given that $f(1)=4,$ find:



(a) $f(-2)$

(b) $f(5)$

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12. (Multiple Choice) If f and g are continuous functions such that $g'(x)=f(x)$ for all x,

then $\int_2^3 f(x)\,dx =$

(A) $g'(2)-g'(3)$ (B) $g'(3)-g'(2)$ (C) $g(3)-g(2)$

(D) $f(3)-f(2)$ (E) $f'(3)-f'(2)$

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13. (Multiple Choice) (Use your calculator.)

If the function $f(x)$ is defined by $f(x)=\sqrt{x^3+2}$ and g is an antiderivative of f such that $g(3)=5$, then $g(1)=$

(A) -3.268 (B) -1.585 (C) 1.732 (D) 6.585 (E) 11.585