AP Calculus AB '20-21 Name_____
Integral Test v2

Score_____

NO CALCULATOR ALLOWED

1. Find $\int_3^6 x^2\ dx$

a) 27 b) 63 c) 189 d) 81 e) 216

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2. $\int_e^{e^2} \frac{1}{x \ln x} dx =$

a) $\ln(\ln(2))$ b) $\frac{2}{e^2}$ c) $\ln 2$

d) $\frac{1-2e}{2e^2}$ e) DNE

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3. If $\int_{-3}^{-1} g(x)\ dx = -19$ and $\int_5^{-1} g(x)\ dx = -14$, then $\int_{-3}^{5} g(x)\ dx =$

a) -33 b) -5 c) 0 d) 5 e) 33

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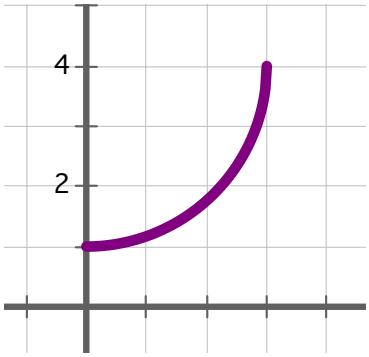
4. The graph of the function f is shown below for $0 \le x \le 3$.



Of the following, which has the smallest value?

a) $\int_0^3 f(x)dx$

b) Left Riemann sum approximation of $\int_0^3 f(x)dx$ with 6 equal sub intervals.

c) Right Riemann sum approximation of $\int_0^3 f(x)dx$ with 6 equal sub intervals.

d) Midpoint Riemann sum approximation of $\int_0^3 f(x)dx$ with 6 equal sub intervals.

e) Trapezoidal sum approximation of $\int_0^3 f(x)dx$ with 6 equal sub intervals.

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5. $\int_2^3 \frac{1}{9+x^2}\,dx$

a) $\frac{1}{3}\tan^{-1}\left(\frac{2}{3}\right)-\frac{\pi}{4}$

b) $\frac{\pi}{4}-\frac{1}{3}\tan^{-1}\left(\frac{2}{3}\right)$

c) $\frac{1}{3}\tan^{-1}\left(\frac{2}{3}\right)$

d) $\frac{\pi}{12}-\frac{1}{3}\tan^{-1}\left(\frac{2}{3}\right)$

e) $\frac{1}{3}\tan^{-1}\left(\frac{2}{3}\right)-\frac{\pi}{12}$

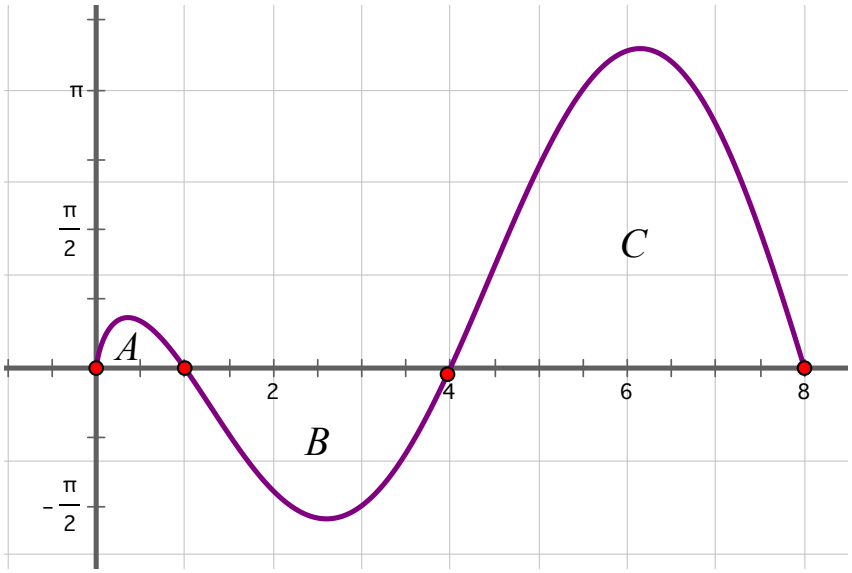
6. The sales of a small company are expected to grow at a rate given by $\frac{dS}{dt} = 300t + t^{1/2} + t^{3/2}$, where $S(t)$ is the sales in dollars per day. The accumulated sales from the first four days is approximately

a) $2400

b) $2406

c) $2412

d) $2418



In the figure above, A, B, and C are areas between the curve $f(x)$ and the x-axis. If $A = 3$, $B = 7$, and $C = 21$, then $\int_0^8 f(x)\,dx =$

a) 31 b) 17 c) 25 d) 28 e) 42

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8. Find the average rate of change of $y = x^2 + 5x + 14$ on $x \in [-1, 2]$

a) 3 b) 6 c) 9 d) $\frac{65}{6}$ e) 20

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t (in minutes)	0	8	16	24	32	40	48
$V(t)$ (in m^3/min)	26	32	43	24	19	24	30

9. Waste flows through a sewage pipe. The table above shows the rate of flow at specific times. Using the right-hand rectangles, the approximate total volume of waste that flowed through the pipe over these 48 minutes is

a) $8[26 + 32 + 43 + 24 + 19 + 24 + 30]$

b) $8[26 + 32 + 43 + 24 + 19 + 24]$

c) $8[32 + 43 + 24 + 19 + 24 + 30]$

d) $4[26 + 32 + 43 + 24 + 19 + 24 + 30]$

e) $4[26 + 2(32) + 2(43) + 2(24) + 2(19) + 2(24) + 30]$

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CALCULATOR ALLOWED
Directions: Show all work.

t months	0	1	2	3	4	5	6
$P(t)$	160.3	192.8	345.7	746.1	944.2	873.0	1128.6

t months	7	8	9	10	11	12
$P(t)$	928.3	851.3	751.3	535.5	216.4	150.7

1. A family leases solar panels on their house. At the end of the year, they receive a report, including the tables above, which shows the monthly production $P(t)$ of electricity, in kilowatts per month (kW/month), from the panels.

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a) Use right-hand Riemann rectangles to approximate $\int_0^{12} P(t)dt$. Indicate the units.

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b) $k(t)=660-489\cos\frac{\pi}{6}t$ is a model of $P(t)$. Find $\int_0^{12}k(t)dt$.

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c) Using the model $k(t)=660-489\cos\frac{\pi}{6}t$, show that the production is decreasing at $t=9$. Is the production decreasing at an increasig rate?

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2. A ski resort uses a snow machine to control the snow level on a ski slope. Over a 24-hour period the volume of snow added to the slope per hour is modeled by the equation $S(t)=24-t\sin^2\left(\frac{t}{14}\right)$. The rate that the snow melts is modeled by $M(t)=10+8\cos\left(\frac{t}{3}\right)$. Both $M(t)$ and $S(t)$ are measured in $\frac{yd^3}{h}$ and t is measured in hours for $0\le t\le 24$. At time t = 0 the slope holds $50 yd^3$ of snow.

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a. How much snow has fallen on the mountain over the first 6 hours. Include the units.

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b. Is the volume of the snow on the mountain increasing or decreasing at t = 4? Justify your answer.

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c. Write an expression for $A(t)$, the total amount of snow on the mountain at time *t*.

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d. Find the absolute maximum and minimum amount of snow on the mountain during $0 \le t \le 24$ hours. Include the units.

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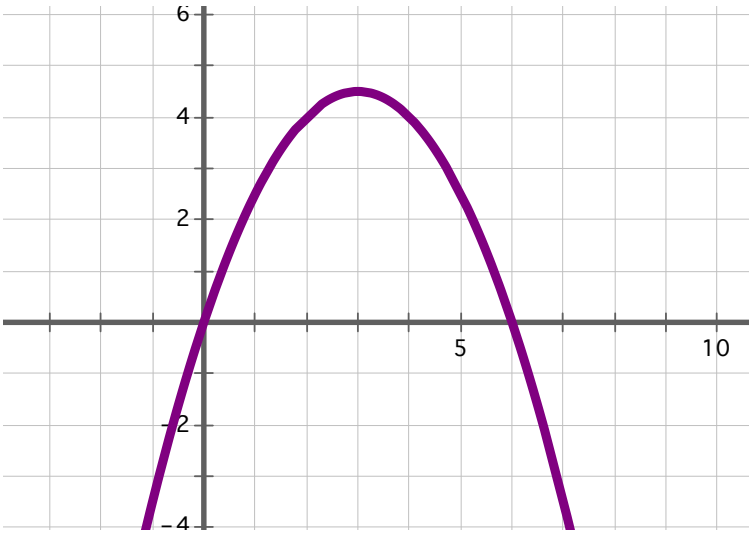
3. Consider the function $g(x)=3x-\frac{1}{2}x^2$ which has the graph below.



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a) Find the zeros of $g(x)$. Show the work that leads to your answer.

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b) Find the exact value of $\int_{-1}^{8} g(x)\,dx$. Show the antiderivative and boundary

insertion steps.

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c) Find the exact area between the x-axis and $g(x)$ on $x \in [-1, 8]$. Show the antiderivative and boundary insertion steps.
