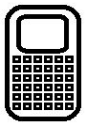
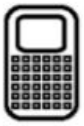
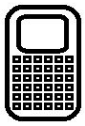
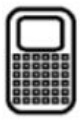
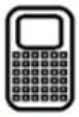
Circuit – Accumulation Models **Name**_____

Directions: Beginning in the first cell marked #1, use your knowledge of the fundamental theorem of calculus to find your answer. To advance in the circuit, hunt for your answer and mark that cell #2. Continue working in this manner until you complete the circuit. Even on problems indicated calculator active, show the set up used.

Ans: 91 __#1___Given $f(2) = 5$ and $f'(x) = x + \sin x$. Find $f(4)$.  $f(4) = 5 + \int_2^4 f'(x)\,dx$ ≈ 11.237	Ans: 2 __**4**__ Given $f(2) = 5$ and $f'(x) = x + \sin x$. Find $f(0)$.  $f(0) = 5 + \int_2^0 f'(x)\,dx$ ≈ 1.5838
Ans: 11.237 __**2**___ A particle moves along a straight line and its velocity is modeled by $v(t) = 30t - 5t^3$. The particle's position is modeled by $s(t)$ and $s(0) = 4$. Find the particle's position at time $t = 3$.  $s(3) = \int_0^3 (30t - 5t^3)\,dt$ $s(3) = 37.75$	Ans: $-1 - \pi$ __**10**__ A printer is publishing multiple copies of a specific document. While printing this document, ink is being used at a rate of $r(t) = 0.2(1 + \cos(\pi x))$, measured in ounces/min. If the printer started the job with 5 ounces of ink in its cartridge, how many ounces of ink will remain in the cartridge after 3 minutes of printing?  $5 - \int_0^3 r(t)\,dt$ 4.4 ounces

Ans: 26

__8__ A mail clerk is making deliveries along a long straight hallway. The clerk's velocity is modeled in meters/min by $v(t) = 4\pi \sin\left(\frac{\pi t}{5}\right)$. If the clerk starts at one end and takes $13\frac{2}{3}$ minutes to finish deliveries, how many meters is the clerk from the starting point when finished?



displacement

$$\int_0^{13\frac{2}{3}} v(t)\,dt = -33.383 \text{ m}$$

$\therefore$ 33.383 m from end of

Ans: 113.383

__14__ A particle moves along a straight line with acceleration modeled by $a(t) = 2t$. The velocity and position of the particle are modeled by $v(t)$ and $x(t)$ respectively. Given $v(0) = 4$ and $x(0) = 5$, find $x(6)$.

$$\int a(t)\,dt = \int 2t\,dt$$

$$v(t) = t^2 + c$$

$$v(0) = 4 = 0 + c$$

$$v(t) = t^2 + 4$$

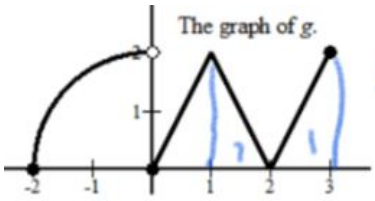
$$x(6) = 5 + \int_0^6 v(t)\,dt = 101$$

Circuit-Accumulation Models

Ans: 37.750

__3__ The graph of g is shown. $f(x) = \int_1^x g(t)dt$.

g consists of a quarter circle and three line segments.



Find $f(3)$.

$$f(3) = \int_1^3 g(t)\,dt$$

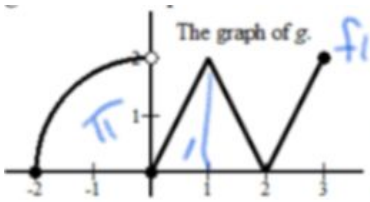
$$= 1 + 1$$

$$= 2$$

Ans: 33.383

___9__ The graph of g is shown. $f(x) = \int_1^x g(t)dt$.

g consists of a quarter circle and three line segments.



Find $f(-2)$.

$$f(-2) = \int_1^{-2} g(t)\,dt$$

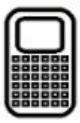
$$= -\int_{-2}^1 g(t)\,dt$$

$$= -(\pi + 1)$$

+

Ans: 12

__13__ A mail clerk is making deliveries along a long straight hallway. The clerk's velocity is modeled in meters/min by $v(t) = 4\pi \sin\left(\frac{\pi t}{5}\right)$. If the clerk starts at one end and takes $13\frac{2}{3}$ minutes to finish deliveries, how many meters did the clerk walk during the $13\frac{2}{3}$ minutes?

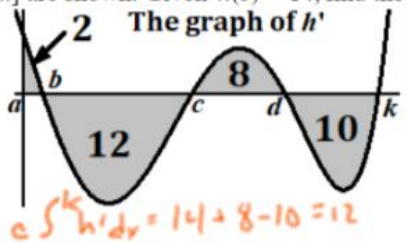


Total Dist.

$$\int_0^{13\frac{2}{3}} |v(t)|\,dt = 113.383$$

Ans: $1 + \pi$

___12__ The values of the areas bounded by the curve h', the derivative of h, and the x-axis on the interval $[a, k]$ are shown. Given $h(c) = 14$, find the minimum of $h(x)$.



$$h(c) = 14$$

$$h(d) = 22$$

$$h(k) = 12$$

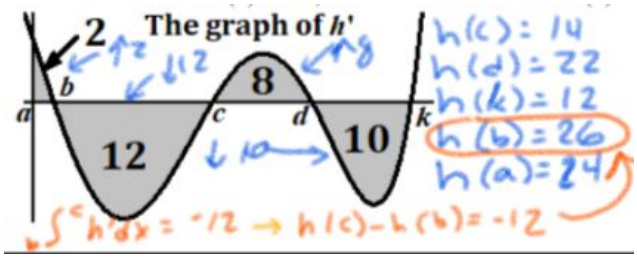
$$h(b) = 26$$

$$h(a) = 24$$

$$\int_c^k h'\,dx = 14 + 8 - 10 = 12$$

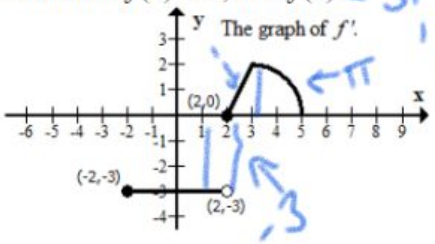
Ans: 0

___7__ The values of the areas bounded by the curve h', the derivative of h, and the x-axis on the interval $[a, k]$ are shown. Given $h(c) = 14$, find the maximum of $h(x)$.



Ans: 4.4

__11__ The graph of f', the derivative of f is given, consisting of two line segments and a quarter circle. Given that $f(1) = 3$, find $f(5)$.



Ans: 1.584

__5__ Oil is pumped into a tank at a rate modeled by $R(t) = 3\cos(\pi t) + 5$ measured in gallons/min. If there are 30 gallons in the tank when the pump starts and no oil is being removed, how many gallons are in the tank after 102 seconds?

Ans: 37.727

__6__ The graph of f', the derivative of f is given, consisting of two line segments and a quarter circle. Given that $f(1) = 3$, find $f(2)$.