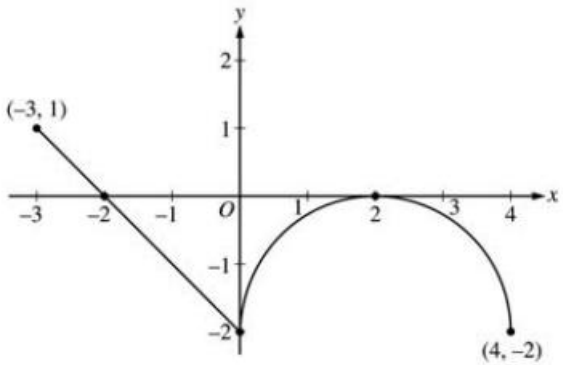
Station1: Accumulation Graph

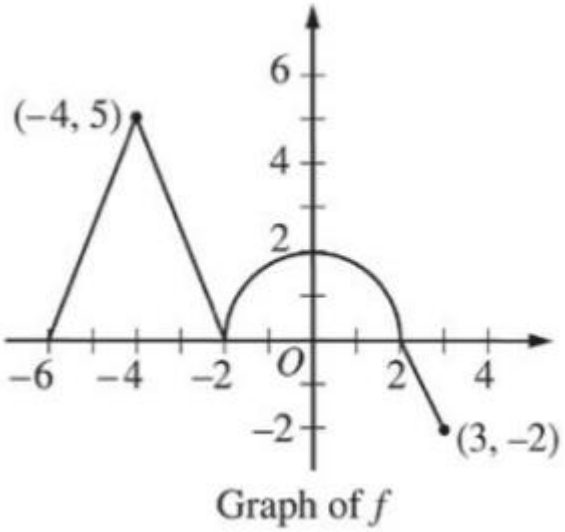
Let *f* be a function defined on the closed interval [-3,4] with *f*(0) = 3. The graph of *f'*, the derivative of *f*, consists of one-line segment and a semicircle, as shown.



1. On what intervals, if any is *f* increasing? Justify.
2. Find $f(-3)$.
3. Find the equation of the tangent line to the function f at the point $(0, -3)$

The graph of the continuous function *f*, consisting of three line segments and a semicircle is shown below. Let *g* be the function given by $g(x) = \int_{-2}^{x} f(t)dt$

4. Find $g(-6)$ and $g(0)$.
5. Find all the values of *x* on the open interval $(-6, 3)$ for which the graph of *g* has a horizontal tangent. Determine whether *g* has a local max, local min, or neither at each of these values. Justify.



Station 2: Integration

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

2. $\int \frac{5dx}{x \ln x}$

3. $\int \left(x^{\frac{1}{3}} + x\sqrt{x} - 2\right) dx$

4. $\int (e^{-x} + \sec^2(\frac{x}{3}))dx$

Station 3: More Integration

1. $\int_2^{-4} |2+x| dx$

2. $\int_0^{1/2} [e^y + 2\cos(\pi y)] dy =$

3. Find the particular solution that satisfies the differential equations and the initial conditions.

$$f''(x) = \frac{2}{x^2}, f'(1) = 1, f(1) = 1, x > 0$$

4. $\int_0^3 \frac{2e^{2x}}{1+e^{2x}} dx$

Station 4: Average Value and FTOC (2)

1. $\frac{d}{dx}\left(\int_{\cos(x^2)}^{2x} x^2 dx\right) =$

2. Given $F(x) = \int_0^{e^{2x}} \ln(t+1)dt$, find $F'(x)$.

3. The acceleration at time t of an object is given by $a(t) = 4\pi \cos t$. What is the average acceleration of the object over the interval $[0,\pi]$?

4. Find the number(s) c guaranteed by the Mean Value Theorem for Integrals for $\int_0^{2\pi} \cos x dx$.

Station 5: Approximation

The diameter of a tunnel $h(x)$ measured in feet is given in different intervals on the table below, with $h'(x) > 0$.

X	5	8	11	13	15	17	19
h(x)	5	6	8	10	11	13	16

1. Use trapezoids to estimate $\int_5^{19} h(x)dx$.
2. Use MRAM to estimate $\int_5^{19} h(x)dx$.
3. Find the average diameter of the tunnel using your answers from question #1. Include unit of measure.
4. If you use RRAM, would it be more than or less than the value of $\int_5^{19} h(x)dx$. Justify your answer.