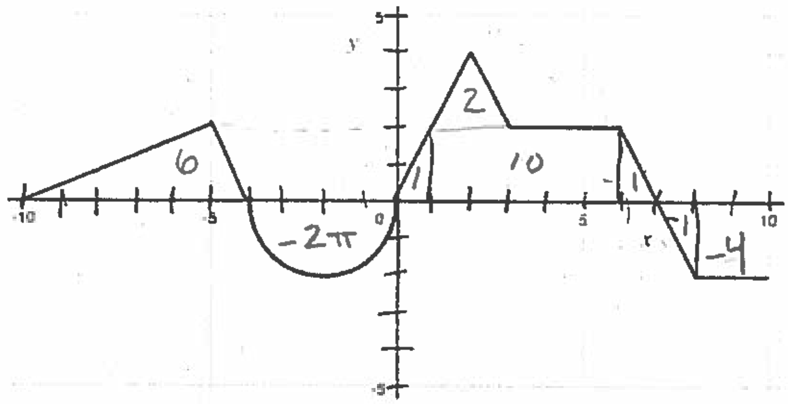
What are you known by: Key

AP Calculus AB: 8.3 FTC with graphs



Use the graph of f(x) above to answer the questions below.

7. $\int_{-3}^{1} f(x-1)\,dx$

$\int_{-4}^{0} f(x)\,dx = \boxed{-2\pi}$

8. $\int_0^6 2f(x) + 6\,dx$

$2\int_0^6 f(x)\,dx + \int_0^6 6\,dx$

$2(13) + [6x]_0^6$

$26 + 36 = \boxed{62}$

9. $\int_5^9 3f(x+1) - 4\,dx$

$3\int_6^{10} f(x)\,dx - \int_5^9 4\,dx$

$3(-4) - [4x]_5^9 = -12 - 16 = \boxed{-28}$

10. $\int_6^{10} |f(x)|\,dx = \boxed{6}$

11. $\int_{10}^{6} |f(x)|\,dx =$

$-\int_6^{10} |f(x)|\,dx = \boxed{-6}$

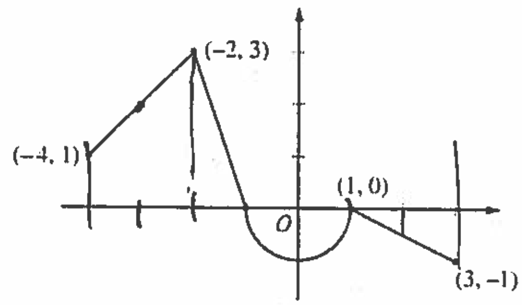
12. $\left|\int_6^{10} f(x)\,dx\right| = \boxed{4}$

13. If $\int_a^b f(x)\,dx = a - 2b$, then find $\int_a^b f(x) + 3\,dx$

$\int_a^b f(x)\,dx + \int_a^b 3\,dx$

$a - 2b + [3x]_a^b = a - 2b + (3b - 3a) = \boxed{-2a + b}$

What are you known by:____________________________



Graph of f

3. 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 above. 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) For each of $g'(-3)$ and $g''(-3)$, find the value or state that it does not exist.

   (c) 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 a maximum at the point. Justify your answers.

   (d) For $-4 < x < 3$, find all values of x for which the graph of g has a point of inflection. Explain your reasoning.

a) $g(2) = \int_1^2 f(t)dt = \frac{bh}{2} = \frac{1(\frac{1}{2})}{2} = \boxed{-\frac{1}{4}}$

$g(-2) = \int_1^{-2} f(t)dt = -\int_{-2}^{1} f(t)\,dt = -\left(\frac{bh}{2} + \frac{\pi r^2}{2}\right) = -\left(\frac{1(3)}{2} + \frac{\pi(1)^2}{2}\right) = \boxed{\frac{-3-\pi}{2}}$

---

b) $g'(-3) = f(-3) = \boxed{2}$ $\qquad g''(-3) = f'(-3) = \frac{3-1}{-2-(-4)} = \frac{2}{2} = \boxed{1}$

---

c) $g'(x) = 0$

$f(x) = 0$ at $\boxed{x = -1 \text{ and } 1}$

$x = -1$ is a relative max because $f(x)$ is positive and changes to negative.

$x = 1$ is neither a max or min because $f(x)$ is negative on both sides of $x = 1$

---

d) $g''(x) = 0$

$f'(x) = 0$ at $\boxed{x = -2, 0, 1}$

These are all POI because the graph of $f(x)$ goes from increasing to decreasing or decreasing to increasing.