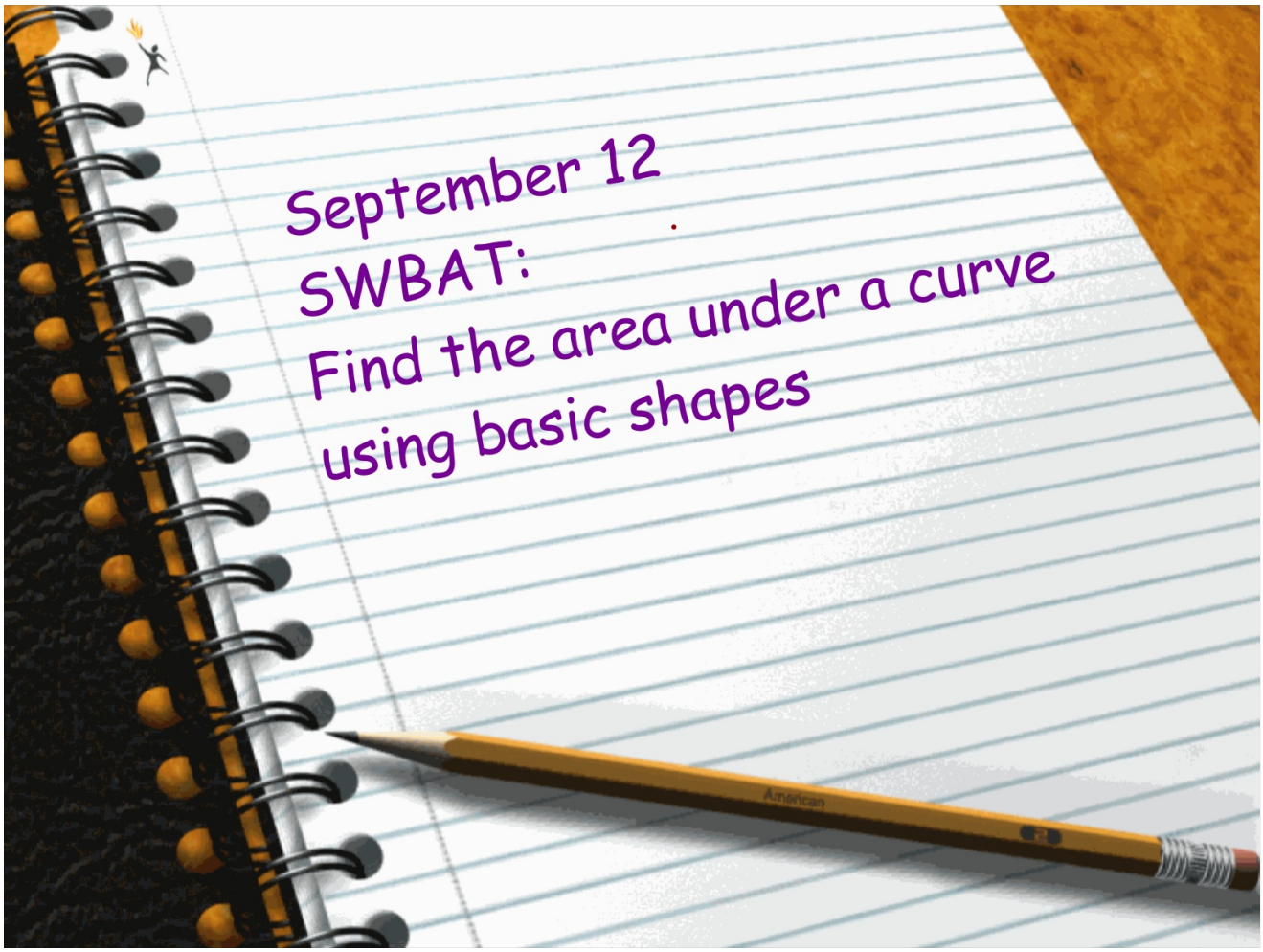
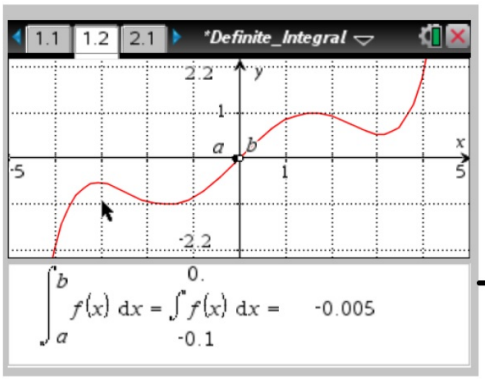


3. For the function f pictured on page 1.2, under what conditions of a and b in [–5, 5] will the definite integral $\int_a^b f(x)\,dx$ be positive? Negative? Zero? Explain your thinking.



Positive

if $a<0$ if $a>0$

$b>-a$ $b>a$

$b<a$ $b<-a$

Negative

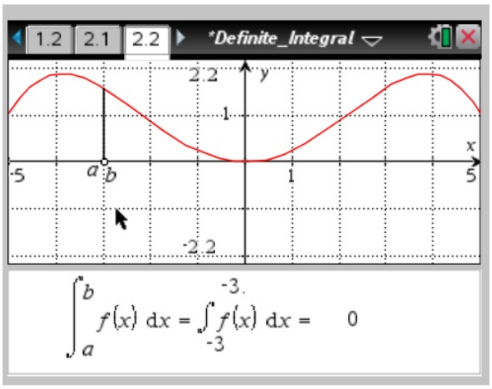
if $a<0$ if $a>0$

$a<b<-a$ $-a<b<a$

Zero

$a=b$ or $a=-b$

5. For the function $f(x)$ pictured on page 2.2, under what conditions of a and b in [–5, 5] will the definite integral $\int_a^b f(x)\,dx$ be positive? Negative? Zero? Explain your thinking.



Positive
$b > a$

Negative
$b < a$

Zero
$b = a$

6. Based on your observations on pages 1.2 and 2.2, for any continuous function f on an interval [c, d] and for a and b in [c, d], when will the definite integral $\int_a^b f(x)\,dx$ be positive? Negative? Zero? Clearly explain your generalization.

$\int_a^b f(x)\,dx$ is positive when

when $b > a$ and there is more area above the x-axis
when $b < a$ and there is more area below the x-axis

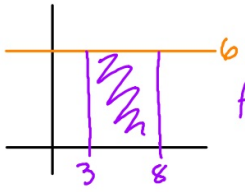
$\int_a^b f(x)\,dx$ is negative when

when $b > a$ and there is more area below the x-axis
when $b < a$ and there is more area above the x-axis

$\int_a^b f(x)\,dx = 0$ when

$b = a$
the area above the x-axis is equal to the area below

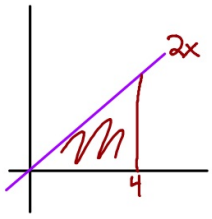
$\int_3^8 6\,dx$



$A = 6(8-3) = 6(5) = 30$

$\int_3^8 6\,dx = 30$

$\int_0^4 2x\,dx$

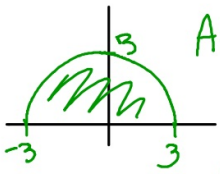


$A = \frac{1}{2}bh = \frac{bh}{2}$

$A = \frac{1}{2}(4)(8) = 16$

$\int_0^4 2x\,dx = 16$

$\int_{-3}^{3} \sqrt{9-x^2}\,dx$



$A = \frac{1}{2}\pi r^2$

$\frac{1}{2}\pi(3)^2 = \frac{9\pi}{2}$

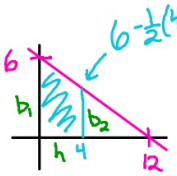
$\int_{-3}^{3} \sqrt{9-x^2}\,dx = \frac{9\pi}{2}$

$x^2 + y^2 = r^2$

$y^2 = r^2 - x^2$

$y = \pm\sqrt{r^2-x^2}$

$\int_0^4 6 - \frac{1}{2}x\,dx$

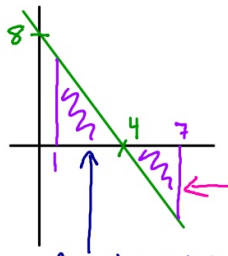


$A = \frac{1}{2}(b_1+b_2)h$

$= \frac{1}{2}(6+4)(4) = 20$

$\int_0^4 6 - \frac{1}{2}x\,dx = 20$

$\int_1^7 8-2x\,dx$



$\int_1^7 8-2x\,dx = 0$

$A_2 = \frac{1}{2}(3)(-6) = -9$

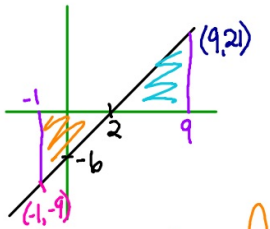
$A_1 = \frac{1}{2}(3)(6) = 9$

$8-2x$

$8-2(7)$

$8-14=-6$

$\int_{-1}^9 3x-6\,dx$



when $x=-1$

$3(-1)-6=-9$

when $x=9$

$3(9)-6=21$

x-intercept

$3x-6=0$

$\frac{3}{3}x=\frac{6}{3}$

$x=2$

$A_1 = \frac{1}{2}(3)(-9) = \frac{-27}{2} = -13.5$

$A_2 = \frac{1}{2}(7)(21) = \frac{147}{2} = 73.5$

$A_1 + A_2 = -13.5 + 73.5 = 60$

$\int_{-1}^9 3x-6\,dx = 60$