# Homework 26

9) $f(x) = 200 + 10t + \frac{1}{3}t^2$ Δ pop from day 0 to 3?

$$\int_0^3 200 + 10t + \frac{1}{3}t^2 \, dt = 200t + 5t^2 + \frac{1}{9}t^3 \Big|_0^3$$

$$= 200 \cdot 3 + 5 \cdot 9 + \frac{1}{9} \cdot 27 - 0 = 600 + 45 + 3 = \underline{648}$$

35 insects on day 0 – how many on day 3?

$$648 + 35 = \underline{683}$$

10) $$\int_2^5 2000t + 1000 \, dt = 1000t^2 + 1000t \Big|_2^5 = 25000 + 5000 - 4000 - 2000$$

$$= \underline{24000}$$

2000 votes on day 0, how many on day 5?

$$\int_0^2 2000t + 1000 \, dt = 1000t^2 + 1000t \Big|_0^2 = 4000 + 2000 = 6000$$

$$2000 + 6000 + 24000 = \underline{32000}$$

# Homework 27

12) $\int_0^4 4(x+1)\sqrt{2x+1}\,dx \stackrel{?}{=} \int_1^9 (u+1)\sqrt{u}\,du$

$u = 2x+1 \quad du = 2dx \qquad u-1 = 2x \Rightarrow x = \frac{u-1}{2}$

$$\int_0^4 \underline{2}\cdot 2(x+1)\sqrt{2x+1}\,\underline{dx} = \int_1^9 \underline{2\left(\tfrac{u-1}{2}+1\right)}\sqrt{u}\,du$$

$$= \int_1^9 (u-1+2)\sqrt{u}\,du = \int_1^9 (u+1)\sqrt{u}\,du \quad \text{TRUE}$$

## Quiz

$u = 2+\sin x \quad du = \cos x\,dx$

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\cos(x)}{\sqrt{2+\sin x}}\,dx = \int \frac{du}{\sqrt{u}} = \int u^{-\frac{1}{2}}du = 2u^{\frac{1}{2}} =$$

$$2(2+\sin x)^{\frac{1}{2}}\Big|_{-\frac{\pi}{2}}^{\frac{\pi}{2}} = 2\left(2+\sin\tfrac{\pi}{2}\right)^{\frac{1}{2}} - 2\left(2+\sin -\tfrac{\pi}{2}\right)^{\frac{1}{2}}$$

$$= 2(2+1)^{\frac{1}{2}} - \left[2(2+-1)^{\frac{1}{2}}\right] = 2\sqrt{3} - 2(1)^{\frac{1}{2}} = \underline{2\sqrt{3}-2}$$

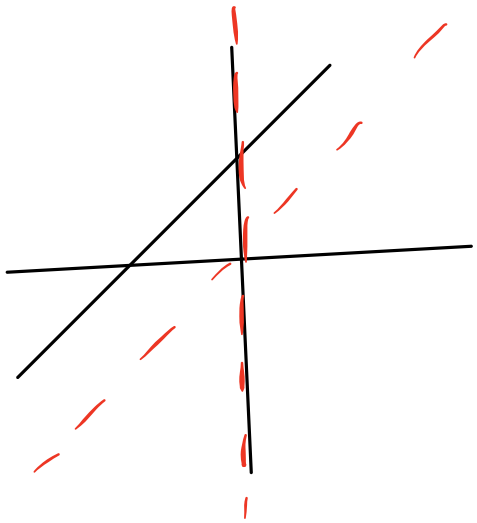
2) $f(x) = e^x + e^{-x}$ $\quad f(x) = f(-x)$

$$e^x + e^{-x} \stackrel{?}{=} e^{-x} + e^{--x}$$

$$= e^{-x} + e^x$$

✓

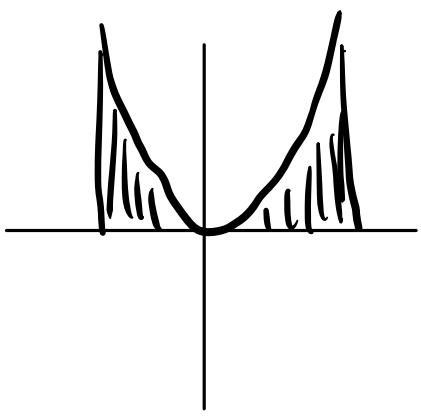
4) $f(x) = x + 3$



neither

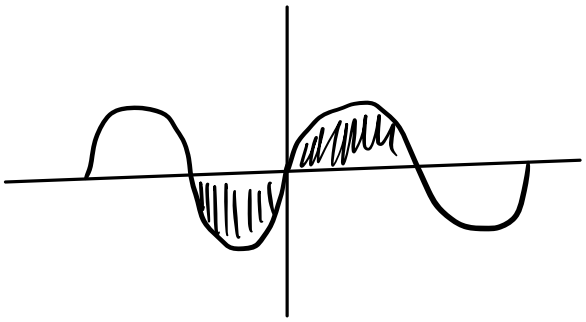
even:

$$\int_{-1}^{1} x^2 dx = 2\int_{0}^{1} x^2 dx$$

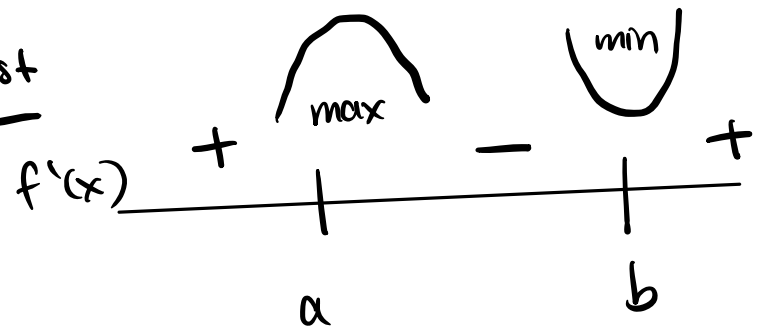


odd:

$$\int_{-\pi}^{\pi} \sin(x) dx = 0$$



1st




2nd

∪ concave up ⇒ min

∩ concave down ⇒ max

## Homework 25

12) $h(x) = \int_{2x}^{x^2} \cos(t)\sin(t)\,dt$

$h'(x) = \cos(x^2)\sin(x^2)\cdot 2x - \cos(2x)\sin(2x)\cdot 2$

11) $h(x) = \int_{x}^{2} t + e^t\,dt$ $\quad h'(x) = -(x + e^x)$

10) $h(x) = \int_{0}^{x} t\sin(t)\,dt$ $\quad h'(x) = x\sin x$

# Homework 27

11) $\int_0^3 \frac{12}{3x+1}\,dx =$ $\quad u = 3x+1 \quad du = 3dx$

$$4\int_0^3 \frac{3}{3x+1}\,dx = 4\int \frac{du}{u} = 4\ln|u| = 4\ln|3x+1|\Big|_0^3$$

$$= 4\ln(10) - 4\ln(1) = 4\ln(10)$$

$u = x^4+2x \quad du = 4x^3+2$

15) $\int_1^2 \frac{8x^3+4}{\sqrt{x^4+2x}}\,dx = 2\int_1^2 \frac{4x^3+2}{\sqrt{x^4+2x}}\,dx = 2\int u^{-\frac{1}{2}}\,du$

$$= 2\cdot 2u^{\frac{1}{2}} = 4(x^4+2x)^{\frac{1}{2}}\Big|_1^2 = 4(16+4) - 4(1+2)$$

$$= 4\sqrt{20} - 4\sqrt{3}$$

$$= 8\sqrt{5} - 4\sqrt{3}$$

$$\lim_{x\to 0^+} x^x = \lim_{x\to 0^+} e^{\ln x^x} = \lim_{x\to 0^+} e^{x\ln x} =$$

$$\lim_{x\to 0^+} e^{\frac{\ln x}{x^{-1}}} = \lim_{x\to 0^+} e^{\frac{\frac{1}{x}}{-\frac{1}{x^2}}} = \lim_{x\to 0^+} e^{\frac{1}{x}\cdot\frac{-x^2}{1}}$$

$$= \lim_{x\to 0^+} e^{-x} = 1$$