

2 (6 points) Compute the integral $\int_{-1}^3 |4t - t^3| dt$.

① Find the zeros

$$4t - t^3 = 0 \Rightarrow t(4 - t^2) = 0 \quad t = 0, \pm 2$$

② Determine if need to multiply by + or - by plugging in test points into $4t - t^3$

$-\infty < t < -2$	$-2 < t < 0$	$0 < t < 2$	$2 < t < \infty$
$t = -3 \quad +$	$t = -1 \quad -$	$t = 1 \quad +$	$t = 3 \quad -$

③ Break up integral

$$\begin{aligned} \int_{-1}^3 |4t - t^3| dt &= \int_{-1}^0 -(4t - t^3) dt + \int_0^2 (4t - t^3) dt + \int_2^3 -(4t - t^3) dt \\ &= -2t^2 + \frac{1}{4}t^4 \Big|_{-1}^0 + 2t^2 - \frac{1}{4}t^4 \Big|_0^2 - 2t^2 + \frac{1}{4}t^4 \Big|_2^3 \\ &= 2 - \frac{1}{4} + 8 - 4 - 18 + \frac{81}{4} + 8 - 4 \\ &= 12 \end{aligned}$$

3 (8 points) Let $f(x) = \int_{x^2}^9 \cos(\pi\sqrt{t}) dt$. Compute the equation of the tangent line to $y = f(x)$ at the point where $x = 3$.