

Math 140 Worksheet 5 — Solution Key

1. (a) $f'(x) = 2x \sin(x) + x^2 \cos(x)$

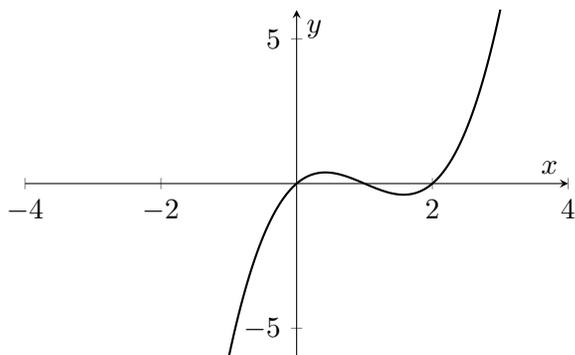
(b) $g'(x) = \frac{-(x^2 + 1) \sin(x) - 2x \cos(x)}{(x^2 + 1)^2}$

2. (a) $h'(x) = 3x^2 - 6x + 2$

(b) $h''(x) = 6x - 6$

(c) Note that $h'(x) = 0$ when $x = 1 \pm \frac{\sqrt{3}}{3}$. Also, note that $h''(x) = 0$ when $x = 1$. Therefore, $h(x)$ is increasing on $(-\infty, 1 - \sqrt{3}/3) \cup (1 + \sqrt{3}/3, \infty)$, decreasing on $(1 - \sqrt{3}/3, 1 + \sqrt{3}/3)$, concave down on $(-\infty, 1)$, and concave up on $(1, \infty)$.

(d)



3.

$$y' = \cos(x^2 + 1) \cdot 2x = 2x \cos(x^2 + 1)$$

4. (a) $p'(x) = -2 \sin(2x)$, $p'(0) = 0$, $p(0) = 1$

Tangent line: $y = 1$

(b) $-2 \sin(2x) = -2 \Rightarrow \sin(2x) = 1$

$$2x = \frac{\pi}{2} + 2\pi k \Rightarrow x = \frac{\pi}{4} + \pi k$$