

Answers are not guaranteed. When in doubt, consult your instructor or TA.

1.

(a) $3x^2 - 5$

(b) $\frac{3x^2(x^2 + x - 2) - (x^3 + 1)(2x + 1)}{(x^2 + x - 2)^2}$

(c) $\frac{2x \sin(7x)}{2\sqrt{x^2 + 1}} + 7 \cos(7x)\sqrt{x^2 + 1}$

(d) $(5/8)(x^{1/7} - 2)^{-3/8}(1/7)x^{-6/7}$

(e) $\sqrt{1 + x^8}(2x)$

2.

(a) $[x^3 - x^2 + x]_0^1 = 1$

(b) zero

(c) $\frac{268}{7}$

(d) Use the substitution $u = 3 + 2x$. Answer is $\frac{54 - 7\sqrt{7}}{5}$

3. Ask your instructor or TA if you can't do this. It must be done directly from the definition of the derivative as the limit $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$.

4. $\frac{dy}{dx} = -\frac{x}{y}$, $\frac{d^2y}{dx^2} = -\frac{8}{y^3}$. Tangent line at $(2, 2)$: $y = -x + 4$, normal line: $y = x$.

5. 6 feet per second.

6. $\frac{125}{6}$

7.

(a) Try Maple to confirm your graph after you have done it by hand.

(b) the asymptotes, Vertical: $x = -3, x = 3$, horizontal: $y = 1$.

(c) Increasing: $(-\infty, -3), (-3, 0)$, decreasing $(0, 3), (3, \infty)$

(d) Concave up: $(-\infty, -3), (3, \infty)$, concave down: $(-3, 3)$.

(e) No inflection points

(f) $(0, 0)$ is a local maximum.

(g) $(0, 0)$ is a critical point. Some authors may consider $x = -3, 3$ as critical values where the derivative may change sign, but the function is undefined there, so this is not standard usage.

8. Width: 3, height: 2.

9. The ball remains aloft for 5 seconds; it strikes the ground at 112 feet per second.