

MATH 126 – FINAL EXAM Answers
SPRING 2018

1. (a) (iii); (b) (i); (c) (iii); (d) (iv); (e) (i).
2. (a) $(0, 2, 2)$
 (b) (answer is not unique) $x = -\pi t$, $y = -1 - t$, $z = 3 - t$
 (c) $\kappa(0) = \pi$
3. (a) $f_{xy} = 4xye^{x^2y} + 2x^3y^2e^{x^2y}$
 (b) $\frac{\partial z}{\partial x} = \frac{\sin y + yx^{y-1}}{4z^3 - 1}$
 (c) $g(2.01, 0.95) \approx 2.04$
4. HINT: Maximize volume $V = xyz$ subject to the constraint $z = 12 - 3x - 2y$:

$$V(x, y) = 12xy - 3x^2y - 2xy^2.$$

ANSWER: Maximum volume: $\frac{32}{3}$

5. $\iint_R \cos(y^2) dA = \int_0^1 \int_{y^3}^y \cos(y^2) dx dy = -\frac{1}{2} \cos(1) + \frac{1}{2}$
6. Volume = $\iint_R e^{x^2+y^2} dA = \int_{-\pi/2}^{\pi/2} \int_0^2 re^{r^2} dr d\theta = \frac{\pi}{2} (e^4 - 1)$
7. (a) $T_2(x) = 2 + \frac{1}{12}(x - 8) - \frac{1}{288}(x - 8)^2$
 (b) HINT: $|f'''(t)| = \frac{10}{27t^{8/3}} \leq \frac{10}{27 \cdot 7^{8/3}}$
 ANSWER: (answer is not unique) $|f(x) - T_2(x)| \leq \frac{10}{27 \cdot 7^{8/3} \cdot 3!}$
 (c) $9^{1/3} = f(9) \approx T_2(9) = 2.080$
8. (a) $f(x) = \sum_{k=0}^{\infty} \frac{(-1)^k 2^{2k+1}}{9^{k+1}} x^{2k} = \frac{2}{9} - \frac{8}{81}x^2 + \frac{32}{729}x^4 - \dots$ for $|x| < \frac{3}{2}$
 (b) $f(x) = \sum_{k=1}^{\infty} \frac{(-1)^k 4^k}{5(2k)!} x^{4k-4} = -\frac{2}{5} + \frac{2}{15}x^4 - \frac{4}{225}x^8 + \dots$ for $-\infty < x < \infty$