

MATH 126 FINAL EXAM ANSWERS
AUTUMN 2010

1. (a) $T_2(x) = e - \frac{e}{2}x^2$
(b) After much simplification, $f'''(x) = e^{\cos x} \sin x \cos x (3 + \cos x)$. So, $|f'''(x)| \leq 4e$ and $|f(x) - T_2(x)| \leq \frac{4e}{3!}(0.1)^3 = 0.001812188$.
2. $\frac{3^{11}}{11 \cdot 2^{11}}$
3. (a) $\frac{71}{210}$
(b) $\frac{1 - \cos(16)}{4}$
(c) $\frac{625\sqrt{2}}{12}$
4. $x - 5y + 3z = 1$
5. (a) $f_x(x, y) = e^{(x+y)} + \frac{1}{1 + (x + y^2)^2}$, $f_y(x, y) = e^{(x+y)} + \frac{2y}{1 + (x + y^2)^2}$
(b) $z = 2(x + 1) + 3(y - 1) + 1$
(c) $f(-0.5, 1.2) \approx 2.6$
6. (a) $g(x, y) = \sqrt{x^2 + y^2 + (x + 2y - 3)^2 + 1}$
(b) $\left(\frac{1}{2}, 1, \frac{\sqrt{5}}{2}\right)$
7. (a) $\vec{v}(t) = \langle t^2 - 1, t + 2, 2t - 3t^2 \rangle$, $\vec{r}(t) = \langle \frac{1}{3}t^3 - t, \frac{1}{2}t^2 + 2t + 2, 1 + t^2 - t^3 \rangle$
(b) $a_T = \frac{7}{\sqrt{10}}$, $a_N = \frac{\sqrt{161}}{\sqrt{10}}$
(c) $\frac{\sqrt{161}}{10\sqrt{10}}$
8. (a) $t = 2$ and $u = 1$
(b) $\theta = \frac{\pi}{6}$
(c) $L = \int_1^2 \sqrt{4u^2 + e^{2(u-1)} + 1} du$
9. (a) For $k = 1$, the level set is the single point $(0, 1)$. For $k = \sqrt{2}$, the level set is the circle $x^2 + (y - 1)^2 = 1$.
(b) $z = \frac{2}{\sqrt{5}}(x - 2) + \sqrt{5}$
(c) hyperboloid of two sheets (but $z = f(x, y)$ is only one of these sheets)