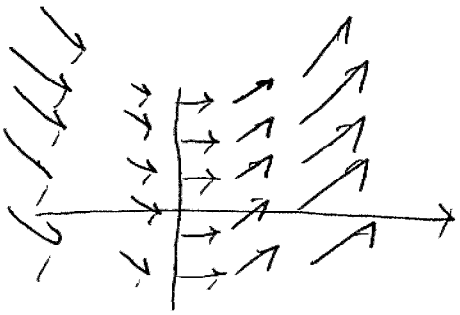
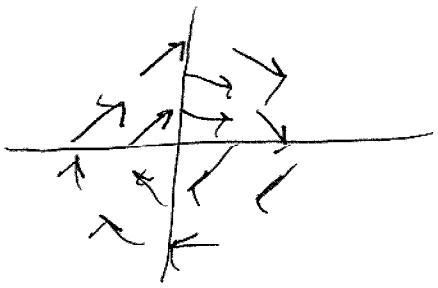
P. 1096

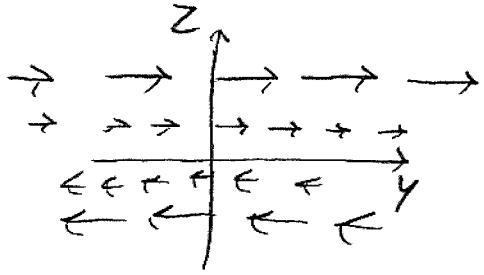
2.



6. $F(x,y) = \dfrac{|y-x|}{\sqrt{x^2+y^2}}$ notice all arrows have length one



8.



translate this picture in the x direction

11. II

12. IV

13. I

14. III

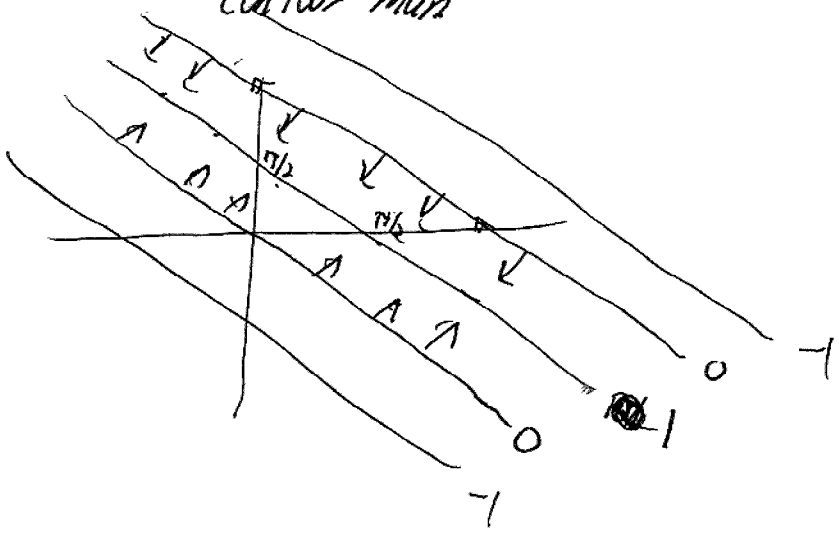
15. IV

16. I

17. III

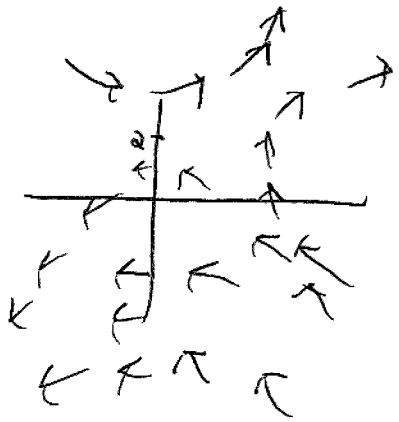
18. II

28. Gradient vectors are ⊥ to contour map



1097.

25. $\nabla f = \langle y-2, x \rangle$



29. IV 30. III 31. II 32. I

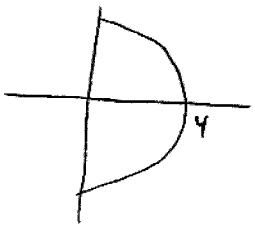
11.1107

2. $\vec{r}(t) = \langle t^4, t^3 \rangle \quad |r'(t)| = \sqrt{16t^6 + 9t^4}$

$$\int_C y/k \, ds = \int_{1/2}^{1} \frac{1}{t}\sqrt{16t^6+9t^4}\,dt = \int_{1/2}^{1} t\sqrt{9+16t^2}$$

$$= \int_{1/2}^{1} \frac{1}{48}(9+16t^2)^{\frac{3}{2}} = \frac{1}{48}(125-13\sqrt{13})$$

3.



C: $\vec{r}(t) = \langle 4\cos t, 4\sin t \rangle \quad -\pi/2 \le t \le \pi/2$

$$|r'(t)| = \sqrt{16\sin^2 t + 16\cos^2 t} = 2\sqrt{4} = 4$$

$$\int_{-\pi/2}^{\pi/2} 4^5 \cdot \sin^4 t \cos t \cdot 2\sqrt{4}\,dt = 2\cdot 4^5 \cdot \frac{1}{5}\sin^5 t \Big|_{-\pi/2}^{\pi/2}$$

$$= \frac{2\cdot 4^5}{5}$$

4. C: $r(t) = (3t+1, 5t+2)$ $0 \le t \le 1$

$$\int_0^1 (5t+2)\, e^{3t+1}\, \|r'(t)\|\, dt = \int_0^1 (5te^{3t+1} + 2e^{3t+1})\sqrt{34}\, dt =$$

$$\left(\frac{5}{9} e^{3t+1}(3t+1) - \frac{16}{9} e^{3t+1} + \frac{2}{6} e^{3t+1} \right)\sqrt{34} \Big|_0^1$$

$$= -\frac{e}{9} + \frac{16}{9} e^4$$

6. $\vec{r}(t) = (e^t, t)$ $0 \le t \le 1$

$$\|r'(t)\| = \sqrt{1+e^{2t}}$$

$$\int_0^1 e^t e^t \sqrt{1+e^{2t}}\, dt = \int_0^1 e^{2t}\sqrt{1+e^{2t}}\, dt = \frac{1}{3}(1+e^{2t})^{3/2} \Big|_0^1$$

$$= \frac{-2\sqrt{2}}{3} + \frac{1}{3}(1+e^2)^{\left(\frac{3}{2}\right)}$$

8. C: ~~$(\cos t, \sin t)$ $0 \le t \le \pi$~~ $(-1-t, 0+3t)$ $0 \le t \le 1$

~~$\|r'(t)\| = 1$~~ $\|r'(t)\| = \sqrt{10}$

$$\int_0^{\pi} \sin(\cos t) + \cos(\sin t)\, dt \quad + \sqrt{10} \int_0^1 \sin(-t-1) + \cos(3t)\, dt$$

8. C: $\langle \cos t, \sin t \rangle$ $0 \le t \le \pi$ $\quad \langle -t-1, 3t \rangle$ $0 \le t \le 1$

$$\int_0^{\pi} \sin(\cos t) \cdot -\sin t \, dt + \cos(\sin t) \cdot \cos t \, dt + \int_0^{1} \sin|-t-1| \cdot (-1) + \cos(3t) \cdot 3 \, dt$$

$$= -\cos(\cos t) + \sin(\sin(t)) \Big|_0^{\pi} \quad -\sin|-t-1| + \sin(3t) \Big|_0^{1}$$

$$= \left(-\cos|-1| + \cos|1| \quad -\sin|-2| + \sin(3) + \sin|-1|\right)$$

12. $\int_0^1 (2t + 9t^3) / \sqrt{1 + 4t^2 + 9t^4} \, dt = \frac{1}{6}(1 + 4t^2 + 9t^4)^{3/2}$

$$= \frac{7\sqrt{14}}{3} - 1/6$$

13 $\int_0^1 t^8 \cdot 2t \, dt =$ (1/9) $= \frac{2t^{10}}{10} \Big|_0^1 =$ (1/5)

16. $\langle 0, 2t, -t \rangle$ $0 \le t \le 1$ Then $\langle 2t+1, 2, 1+t \rangle$ $0 \le t \le 1$

$$\int_0^1 t^2 + 4t^2 \cdot 2 + t^2 \cdot (-1) \, dt + \int_0^1 |2t+1|^2 \cdot 2 + 4 \cdot 0 + |t-1|^2 \cdot 1 \, dt$$

$$= \int_0^1 8t^2 \, dt + \int_0^1 2|2t+1|^2 + |t-1|^2 \, dt$$

$$= \frac{8}{3}t^3 \Big|_0^1 + \frac{1}{3}|2t+1|^3 + \frac{1}{3}|t-1|^3 \Big|_0^1$$

$$= \frac{8}{3} + 9 - \frac{1}{3} - -\frac{1}{3} = (35/3)$$

1107

17. a. positive b. neg

18. $\int_4^5 > 0$ $\int_5^5 = 0$

19. $\int_0^1 (t^4(-t^3)^3 + t^3 \cdot t) \cdot \langle 2t, -3t^2 \rangle \, dt$

$= \int_0^1 -2t^{14} - 3t^6 = -\frac{1}{15}t^{15} - \frac{3}{7}t^7 \Big|_0^1 = -3/7 - 2/15 = -59/105$

$= (-59/105)$

20. $\int_0^2 \langle t^5, t^4, t^3 \rangle \cdot \langle 1, 2t, 3t^2 \rangle \, dt$

$= \int_0^2 t^5 + 2t^5 + 3t^5 = \int_0^2 6t^5 = t^6 \Big|_0^2 = (64)$

21. $\int_0^1 \langle \sin(t^3), \cos(-t^2), t^4 \rangle \cdot \langle 3t^2, -2t, 1 \rangle \, dt$

$= \int_0^1 3t^2 \sin(t^3) - 2t\cos(-t^2) + t^4 \, dt$

$= -\cos(t^3) + \sin(-t^2) + \frac{1}{5}t^5 \Big|_0^1$

$= -\cos 1 + \sin(-1) + 1/5 - (-1 - 0)$

$= 6/5 - \cos(1) + \sin(-1)$

$= (6/5 - \cos(1) - \sin(1))$