Final Exam Fall 2012
Short Answers

1. $a = 5/3$

2. $x + y = 2$

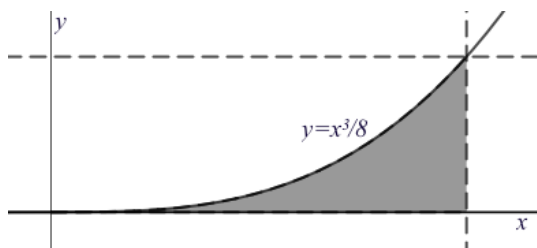3. $\vec{v} = \sqrt{\dfrac{10}{7}}\,(5\vec{i} + 3\vec{j} - 6\vec{k})$

4. $(0, 0, 3)$ and $(0, 0, -3)$

5. $\vec{r}(t) = (\vec{i} - 3\vec{j} + 5\vec{k}) + t(5\vec{i} + 3\vec{j} - \vec{k})$

6. $1/5$

7. -9

8. (a) $\displaystyle\int_0^2 \int_0^{x^3/8} \frac{1}{1+x^4}\, dy\, dx$

$y = x^3/8$

(b) $\dfrac{1}{32}\ln(17)$

9. (a) $3/2$
   (b) 20
   (c) 32π

10. $-2(x - \pi) - (y - \pi) + (z - 5) = 0$

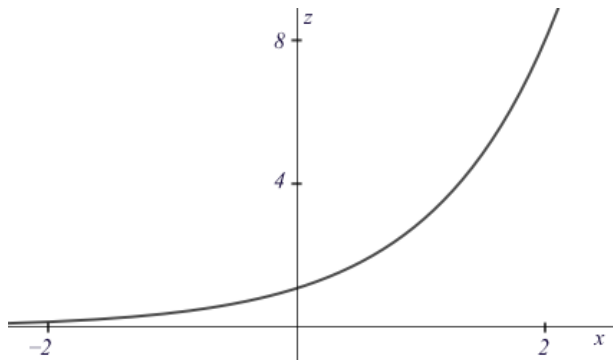11. (a) $xz\vec{i} + (x - yz)\vec{j} - x\vec{k}$
    (b) 0

12. (a) $\left(\dfrac{-2}{2-a}, \dfrac{1}{2-a}\right)$
    (b) $a \geq 2$

13. (a)

    (b) positive, positive

    (c) $\dfrac{1}{\sqrt{5}}(2\vec{i} + \vec{j})$

14. (a) $\displaystyle\int_{0}^{\pi/4}\int_{\pi/2}^{3\pi/2}\int_{0}^{3\sqrt{2}} \rho^4\sin^3\phi\sin\theta\cos\theta\ d\rho\,d\theta\,d\phi$

    (b) $\displaystyle\int_{\pi/2}^{3\pi/2}\int_{0}^{3}\int_{r}^{\sqrt{18-r^2}} r^3\sin\theta\cos\theta\ dzdrd\theta$

15. (a) $f(x,y) = e^{x^2-5y}$

    (b) $e^4 - e^{-10}$