Answers to Past Final Exams
Fall 2005

1. (a) $\dfrac{\cos(3x)(4x^3-2)-(x^4-2x+5)(-3\sin(3x))}{\cos^2(3x)}$

   (b) $e^{\sin(2t)}(2\cos(2t))+2\cos(e^t)e^t$

   (c) $\dfrac{3x^2}{x^3+1}+\dfrac{1}{1+x^2}+\dfrac{2x}{(1+x^2)^2}$

2. (a) $\dfrac{364}{3}$

   (b) $\dfrac{1}{2}\left(1-\dfrac{1}{e}\right)$

   (c) $3\sin x-5\cos x+C$

3. A
4. A
5. B
6. E
7. D
8. D
9. A
10. C
11. E
12. D
13. magnitude: $\sqrt{(10\sqrt{2}-4)^2+(10\sqrt{2})^2}$; direction: $\theta=\tan^{-1}\left(\dfrac{10\sqrt{2}}{10\sqrt{2}-4}\right)$
14. $f'(x)=8x-1$
15. vector form: $\mathbf{r}(t)=\left(\dfrac{1}{2}-\sqrt{3}\,t\right)\mathbf{i}+\left(\dfrac{\pi}{12}+\left(\dfrac{1}{2}+\dfrac{\sqrt{3}\,\pi}{12}\right)t\right)\mathbf{j}$; Cartesian form: $y-\dfrac{\pi}{12}=\dfrac{\frac{1}{2}+\frac{\sqrt{3}\,\pi}{12}}{-\sqrt{3}}\left(x-\dfrac{1}{2}\right)$
16. $\dfrac{30}{\sqrt{10}}$ km/hr
17. Entire wire to circle
18. $\ln(1.5)+\ln(2.5)+2\ln(4)$

Fall 2006

1. A
2. B
3. A
4. D
5. D
6. C
7. B
8. E
9. B and D
10. A
11. C
12. C
13. $A = \cos^{-1}\left(\frac{3}{\sqrt{10}}\right)$
14. $\frac{3}{8}$
15. $\frac{13}{9}$
16. $\frac{1600}{9\pi(75)^2}$ cm/sec
17. $\frac{512\pi}{81}$ (NOTE: no units given in problem)
18. $\mathbf{r}(t) = (20t)\mathbf{i} + (-4.9t^2 + 20\sqrt{3}\,t)\mathbf{j}$; distance $= \frac{4000\sqrt{3}}{49}$ m.
19. (NOTE: I am calling the last intercept x) inc $(a, d) \cup (x, \infty)$; dec $(-\infty, a) \cup (d, x)$; conc up $(-\infty, b) \cup (e, \infty)$; conc down (b, e).
20. $\frac{34}{3}$

Fall 2007

1. C
2. A
3. D
4. E
5. A
6. C
7. C
8. A
9. B
10. A
11. D
12. E
13. A
14. $\frac{1}{3}$
15. 50 km/hr
16. Vector: $\mathbf{r}(t) = \left(\frac{\pi}{2} + t\right)\mathbf{i} + \left(-\frac{\pi}{2}t\right)\mathbf{j}$; Cartesian: $y = -\frac{\pi}{2}\left(x - \frac{\pi}{2}\right)$
17. $4\sqrt{2} \times 2\sqrt{2}$ (no units given)
18. (a) HA: $y = 0$; VA: $x = 3$
    (b) dec: $(-\infty, -3) \cup (3, \infty)$; inc: $(-3, 3)$
    (c) local min $(-3, -\frac{1}{12})$;no local max
19. (a) $\frac{\pi}{6}$
    (b) $\frac{72}{5}$