Answers to problems from review for Test 2

1. (a) $f'(x) = (5x^4 + 9x^2 - 1)(x^4 - 2x^2 + 4) + (x^5 + 3x^3 - x + 10)(4x^2 - 8x)$

   (b) $f'(x) = \dfrac{2(2x+3)(\sqrt{x}+2) - x^{-1/2}(x^2+3x+3)}{2(\sqrt{x}+2)^2}$

   (c) $f'(x) = 1 + \dfrac{5}{3}x^{2/3} + \dfrac{3}{2}x^{1/2} - \dfrac{3}{2}x^{-5/2} + \dfrac{2}{3}x^{-1/3}$

2. $y = \dfrac{7}{4}(x-1) + 2$

3. (a) $v(t) = 3t^2 - 12$, $a(t) = 6t$

   (b) $t > 2$

   (c) 23

4. (a) $\dfrac{5}{2}$

   (b) $(\csc 2x)^{-1/2}(-\csc 2x \cot 2x) + 4x \tan(x^2+1)\sec^2(x^2+1)$

5. $y' = \dfrac{1}{2}(xe^x + x)^{-1/2}(1 + e^x + xe^x)$

6. $y' = \dfrac{y^2 \sec^2 x - \cos(x+y)}{\cos(x+y) - 2y\tan x}$

7. Points of intersection $(1,1)$, $(1,-1)$. At $(1,1)$: $k_1 = 2$, $k_2 = -\dfrac{1}{2}$, $k_1k_2 = -1$, therefore tangent lines are orthogonal. At $(1,-1)$: $k_1 = -2$, $k_2 = \dfrac{1}{2}$, $k_1k_2 = -1$, therefore tangent lines are orthogonal.

8. Vector equation: $< x, y > = < 3, 0 > + t < 4, 2 >$. Parametric equations: $x = 3 + 4t$, $y = 2t$

9. $\vec{v}(1) = < 1, 15 >$, $s(1) = \sqrt{226}$, $\vec{a}(1) = < 0, -10 >$

10. $y'' = 2e^{-5x}(8\cos 3x + 30\sin 3x)$

11. Slope of the tangent line equals $-\dfrac{12}{7}$ when $t = -1$ and $t = -\dfrac{4}{3}$. Point on the curve corresponding to $t = -1$ is $(-5, 6)$. Point on the curve corresponding to $t = -\dfrac{4}{3}$ is $(-\dfrac{208}{27}, \dfrac{32}{3})$.

12. -0.15 rad/min

13. $\dfrac{1}{80}$ m/min

14. $\dfrac{84}{\pi}$ cm

15. ≈ 58.24

16. $\dfrac{1}{1+x^2} \approx \dfrac{1}{2} - \dfrac{1}{2}(x-1)$, $\dfrac{1}{1+x^2} \approx \dfrac{1}{2} - \dfrac{1}{2}(x-1) + \dfrac{1}{4}(x-1)^2$

17. (a) 1

    (b) $y' = e^{x\cos x}(\cos x - x\sin x)$

18. $f^{-1}(x) = \dfrac{5x+1}{3+2y}$

19. $\dfrac{1}{4}$

20. $\dfrac{1}{2}$