

Answers for Sample Exam #2

1. a) $\frac{2}{x} - 1$ OR $\left(\frac{e^x}{x^2}\right) \left(\frac{2xe^x - x^2e^x}{e^{2x}}\right)$ OR ...
 b) $-(3^6)(\sin 3x)$
 c) $(-\sin x)(\ln 3)3^{\cos x}$
 d) 15
 e) $\frac{1}{2\sqrt{3}}$ (decimal approximation is not fully adequate)
2. $f'(x) = 0$ for any nonzero x ($f'(0)$ doesn't exist); so $f(x)$ is constant on $(-\infty, 0)$, also on $(0, \infty)$; $f(-1) = -\pi/2$, so $f(x) = -\pi/2$ on $(-\infty, 0)$, and $f(1) = \pi/2$ so $f(x) = \pi/2$ on $(0, \infty)$ OR evaluate the constants by using the calculator values of $f(a)$ and $f(b)$ for some negative a and positive b
3. $k = \frac{1 \pm \sqrt{5}}{2}$ (decimal approximation is not fully adequate)
4. $x_1 = 4 + \frac{1}{5}$, OR $x_1 = \frac{21}{5}$, OR $x_1 = 4.2$
5. $\left(\frac{3a}{4}\right)^3 \left(\frac{5a}{4}\right)^5$ OR $(3^3)(5^5) \left(\frac{a}{4}\right)^8$ OR ...
6. the interval $0 \leq x \leq \frac{1}{50}$ OR $[0, 1/50]$
7. 10
8. 5.2; the approximation is smaller than the true value; since the second derivative $(2x/3)(x^2 - 1)^{-2/3}$ is positive for $x > 1$, the curve is concave up, that is, the tangent line at $x = 3$ lies below the curve for x near 3 (rough sketch would be nice)
9. $k = e$
10. a) $4e^{\frac{7}{14} \ln(\frac{484}{4})}$ (acceptable) OR 4.4 (this can be obtained even without a calculator)
 b) 4.4k kilograms per day, where $k = \frac{\ln(1.21)}{14} = \frac{\ln(1.1)}{7}$, OR any equivalent expression OR about 0.06 kilograms per day
11. $\frac{10}{27}$ units per second, OR $0.\overline{370}$ (ugly), OR about 0.37 units per second

12. a) $s'(t) = \frac{1 - \cos 2t}{2}$

b) $\frac{\pi}{8} - \frac{1}{4}$ OR $\frac{\pi - 2}{8}$ OR even 0.1426991

13. 80 hours