

Math 115 Fall 13 Final Answers

1) a) $42x^2 \sin(x) + 14x^3 \cos(x)$

b) $-\frac{165}{(9 + 15x)^2}$

c) $22 \tan(11x) \sec^2(11x)$

2) $-\frac{\pi}{2}(x - 1) = y - \frac{\pi}{2}$

3) a) Increasing on $(3/2, 6)$ and $(6, \infty)$; decreasing on $(-\infty, 3/2)$. Local min $x = 3/2$; no local max.

b) Concave up on $(-\infty, 3)$, $(6, \infty)$; concave down on $(3, 6)$. Inflection points: $x = 3, 6$.

4) a) $-\frac{5x^3}{3} + x^{10} + C$

b) $\frac{\sqrt{17} - 1}{2}$

c) $47/480$

5) a) $\frac{\sqrt{2}}{5\pi}$

b) $4/7$

c) 0

6) a) $\lim_{x \rightarrow a^+} f(x) = \lim_{x \rightarrow a^-} f(x) = f(a)$.

b) $k = -3$.

7) a) We have that $f(0) = -24 < 0$ and that $f(2) = 3438 > 0$, so since f is continuous, by the intermediate value theorem, f has a zero in $(0, 2)$.

b) Taking the derivative, $f'(x) = 54x^8 + 60x^4 + 3 \geq 3 > 0$, so f is always increasing and therefore has only one zero.

c) Approximately 1.0239.

8) a) $x = 0$ and $x = 2$.

b) $\int_0^3 (2x - x^2 + 3) - (3 - x) dx$

c) $\pi \int_0^3 (2x - x^2 + 3)^2 - (3 - x)^2 dx$

9) a) $C(r) = .01\pi r^2 + \frac{540\pi}{r}$.

b) $r = 30$, $h = 10$. By the second derivative test, since $C''(r) = .02\pi + \frac{1080\pi}{r^3} > 0$ for all $r > 0$, this is a minimum.

10) a) No, thanks.

b) $\tan(\theta) = \frac{x}{35}$.

c) 245/1369 rad/s