Sec. 11.9: Representations of Functions as Power Series

5. **(2 pts) Power Series:**
[SDSU M151 F20 MiniTest5 V1 Q5 04/Dec/2020 3:00-4:10pm PDT — Do NOT share/distribute/post/upload]
[Remember to **stop** solving and **submit** when there are **10 mins** (or more) left on the clock!!! No late submissions!]

Use the fact that the function $f(x)$ can be written as the following power series: $\boldsymbol{f(x) = \sum_{n=0}^{\infty} \frac{(-1)^n x^{n+1}}{2^n}}$,

(a) $\boldsymbol{h(x) = \frac{d}{dx}\left[f(x^3)\right]}$

$h(x) = \sum_{n=0}^{\infty}$ [ ]

(b) $\boldsymbol{w(x) = \int x\, f(x^2)\, dx}$ [The constant $\boldsymbol{C}$ is already written for you].

$w(x) = \sum_{n=0}^{\infty}$ [ ] $+ \boldsymbol{C}$

Sec. 11.10: Taylor and Maclaurin Series

6. **(3 pts) Taylor Series:**
[SDSU M151 F20 MiniTest5 V1 Q6 04/Dec/2020 3:00-4:10pm PDT — Do NOT share/distribute/post/upload]
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Compute the Taylor polynomial of order 3 (i.e. third degree polynomial) for $\boldsymbol{f(x) = \dfrac{1}{\sqrt{x+2}}}$ about $\boldsymbol{x = B}$, where $\boldsymbol{B}$ is a CONSTANT.

$f(x) \approx$

7. **(3 pts) Taylor Series:**
[SDSU M151 F20 MiniTest5 V1 Q7 04/Dec/2020 3:00-4:10pm PDT — Do NOT share/distribute/post/upload]
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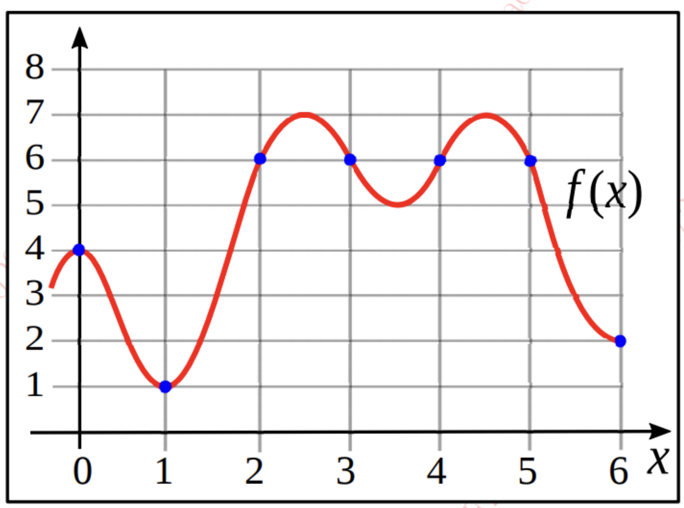
Suppose that you are given the graph of the function $f(x)$ depicted on the right. Let us denote $T_n(x)$ the Taylor polynomial approximation of order n [$n = 0$ denotes a constant, $n = 1$ denotes a LINEAR approximation, $n = 2$ denotes a QUADRATIC approximation, etc...]. Sketch the graphs of the following Taylor approximations:

(a) T_0 at $\boldsymbol{x = 0}$ (use a **solid** line).
(b) T_1 at $\boldsymbol{x = 1}$ (use a line made of **large dots**).
(c) T_2 at $\boldsymbol{x = 1}$ (use a **thick solid** line).
(d) T_1 at $\boldsymbol{x = 2}$ (use a **dashed** line).
(e) T_3 at $\boldsymbol{x = 3}$ (use a **thick solid** line).
(f) T_1 at $\boldsymbol{x = 4}$ (use a **dashed** line).

Label ALL your curves using (a), (b), ..., (e), (f).

[If you are not printing this page please reproduce the graph as precisely as possible!]



Sec. 11.11: Applications of Taylor Polynomials (no Taylor inequality nor remainder)

extra **EXTRA CREDIT (2 pts) Application of Taylor Series:**
[SDSU M151 F20 MiniTest5 V1 Qextra 04/Dec/2020 3:00-4:10pm PDT — Do NOT share/distribute/post/upload]
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L'Hopital rule: If $\lim_{x\to a} f(x) = 0$ and $\lim_{x\to a} g(x) = 0$, one can compute the limit $\lim_{x\to a} \frac{f(x)}{g(x)}$ by computing $\lim_{x\to a} \frac{f'(x)}{g'(x)}$.
By **Taylor expanding** f and g about $x = a$, prove L'Hopital rule and give the conditions when it can used.

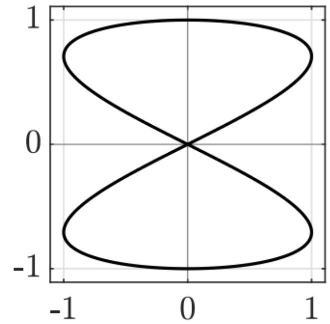
Sec. 10.1: Curves Defined by Parametric Equations

2. (4 pts) **Parametric Equations: Slopes and Tangents**
[SDSU M151 F20 MiniTest5 V1 Q2 04/Dec/2020 3:00-4:10pm PDT — Do NOT share/distribute/post/upload]
[Remember to **stop** solving and **submit** when there are **10 mins** (or more) left on the clock!!! No late submissions!]

Consider the following parametric equation for $\mathbf{0 \le t \le 2\pi}$:

$$\begin{cases} x(t) = \sin(2t) \\ y(t) = \cos(t) \end{cases}$$

whose graph is depicted in the figure.
[Hint: $\cos(\pi/4) = \sin(\pi/4) = \sqrt{2}/2$]



a) Using calculus, find the points (x, y) with $\boldsymbol{y \ge 0}$ that correspond to vertical and horizontal tangency points.
You must show your work... No work shown → no points!

Horizontal $t =$, $(x,y)=(\quad , \quad)$

Vertical: $t =$, $(x,y)=(\quad , \quad)$ $t =$, $(x,y)=(\quad , \quad)$

b) For what value of t the parametric curve goes through the origin for the FIRST time?

$t =$

Find the slope at this time.

$m =$

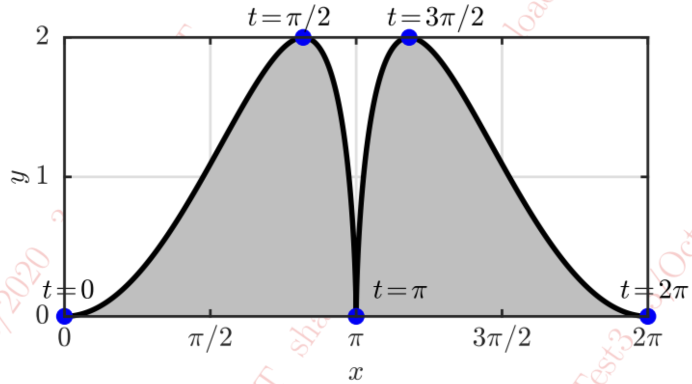
Sec. 10.2: Calculus with parametric Equations

3. **(4 pts) Parametric Equations: Arclength and Areas**
[`SDSU M151 F20 MiniTest5 V1 Q3 04/Dec/2020 3:00-4:10pm PDT` — Do NOT share/distribute/post/upload]
[Remember to **stop** solving and **submit** when there are **10 mins** (or more) left on the clock!!! No late submissions!]

Consider the following parametric curve:

$$\begin{cases} x(t) = t + \sin(t) \\ y(t) = 1 - \cos(2t) \end{cases} \quad \text{for } 0 \le t \le 2\pi,$$

whose graph is depicted in the figure.



a) Write an explicit integral for the TOTAL length of the curve. [You do NOT need to compute the integral].

$L = \int_{\square}^{\square} \square \; d\square$

b) Write an explicit integral for the shaded area. [You do NOT need to compute the integral].

$A = \int_{\square}^{\square} \square \; d\square$

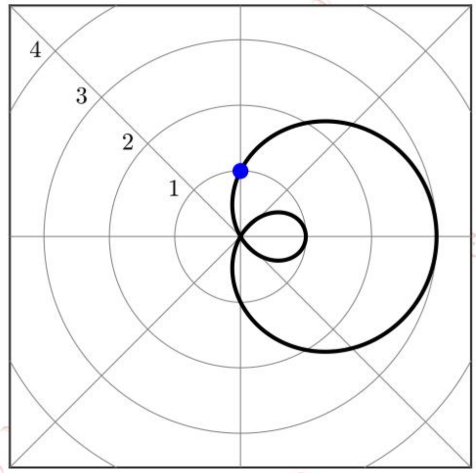
Sec. 10.3: Polar Coordinates

4. **(3 pts) Polar Equations: Slopes and Tangents**
[SDSU M151 F20 MiniTest5 V1 Q4 04/Dec/2020 3:00-4:10pm PDT — Do NOT share/distribute/post/upload]
[Remember to **stop** solving and **submit** when there are **10 mins** (or more) left on the clock!!! No late submissions!]

Consider the following polar curve, for $\mathbf{0 \leq \theta \leq 2\pi}$:

$$r = 1 + 2\cos(\theta),$$

whose graph is depicted in the figure.



a) Find the slope of the tangent line to the curve as a function of θ.

$m(\theta) =$

b) Find the slope of the tangent line to the curve at the point depicted in the figure.

$m_{\text{point}} =$